The State of the Root-Pike River Basin

May, 2002

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Photo courtesy of Rick Reinders

A report by the Wisconsin Department of Natural Resources in cooperation with the Root-Pike Watershed Initiative Network and other stakeholders

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State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

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To: Recipients of *The State of the Root-Pike Basin Report*

We are pleased to present our first *State of the Root-Pike River Basin* report. This report provides an overview of the land and water resource quality and identifies challenges facing these resources in the Oak Creek, Root and Pike River Watersheds. It also outlines recommended actions the Wisconsin Department of Natural Resources and its many partners can take over the next few years to conserve and restore our natural resources throughout the Root-Pike River Basin.

The report considered other recent natural resource planning documents and reflects an ecosystem approach. This ecosystem approach realizes that environmental, social and economic elements factor into our resource management decision making process. The plan reflects the Departments' strategic plan goals of *Making People Our Strength, Sustaining Ecosystems, Protecting Health and Safety, and Providing for Outdoor Recreation.*

The general nature of this report does not allow us the opportunity to provide detailed information on all resources and issues. However, Internet links and phone numbers are provided throughout this report so readers wanting more detail can easily find the information.

This report is a work in progress and we welcome your comments. As objectives are met and projects are completed, we will provide updates on our Root-Pike River Basin Internet page at http://www.dnr.state.wi.us/org/gmu/rootpike. We look forward to maintaining a relationship with all our partners and the public as we work together to protect, conserve, restore and enhance our natural resources throughout the Root-Pike River Basin.

Sincerely,

Michael Allan Luba,P.E.
Root-Pike Basin Water Leader

Jim McNelly
Root-Pike Basin Land Leader

ACKNOWLEDGMENTS

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This plan also serves as an implementation component of Wisconsin's Fisheries, Habitat and Wildlife Strategic Implementation Plan.

This report can also be found on the DNR website at
http://www.dnr.state.wi.us/org/gmu/rootpike/index.htm

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SUMMARY

The rivers, lakes, groundwater and lands in the Root-Pike River Basin sustain a wide range of plant and animal life (Figure 1). Today we are challenged with finding ways to balance our use of land and water with our desire to protect, restore and enhance the natural resources in the Root-Pike River Basin. Building and maintaining strong partnerships with shared visions and goals are essential to striking this balance.

MISSION AND GOALS

The Wisconsin Department of Natural Resources (WDNR) operates with a broad mission for managing natural resources of the state (see box, below right). The WDNR recently completed a strategic plan guided by this mission. The four main goals outlined below provide a blueprint for WDNR staff and partners to cooperatively carry out this mission. *The State of the Root-Pike River Basin Report* provides a framework for managing our resources within a context of shared responsibility.

WDNR Mission Statement

To protect and enhance our natural resources:
our air, land and water;
our wildlife, fish and forests
and the ecosystems that sustain all life.
To provide a healthy, sustainable environment
and a full range of outdoor opportunities.
To ensure the right of all people
to use and enjoy these resources
in their work and leisure.
To work with people
to understand each other's views
and to carry out the public will.
And in this partnership
consider the future
and generations to follow.

I. Making People Our Strength

We must promote people, organizations and officials working together to provide Wisconsin with healthy, sustainable ecosystems. In partnership with all publics it is imperative we find innovative ways to set priorities, to accomplish tasks and to evaluate successes to keep Wisconsin in the forefront of environmental quality and science-based management.

II. Sustaining Ecosystems

We must work to ensure the state's ecosystems become and remain balanced and diverse. Sound decisions that reflect long-term considerations of healthy environments and a sustainable economy will help us protect, manage and use these ecosystems in a balanced way.

III. Protecting Public Health and Safety

We must work to ensure our lands, surface waters, groundwater and air are safe for humans and other living things that depend upon them and that people are protected by the laws governing natural resources in their livelihoods and recreation.

IV. Providing Outdoor Recreation

We must provide citizens and visitors with opportunities and access to areas in which they can enjoy a full range of nature-based outdoor recreations.

For the complete text of the WDNR Strategic Plan, please visit us on the web at www.dnr.state.wi.us/aboutdnr/plans.

REPORT STRUCTURE

This report has several components aimed at addressing the WDNR Strategic Planning Goals. These components are listed below along with cross references to chapters and appendices. This plan specifically

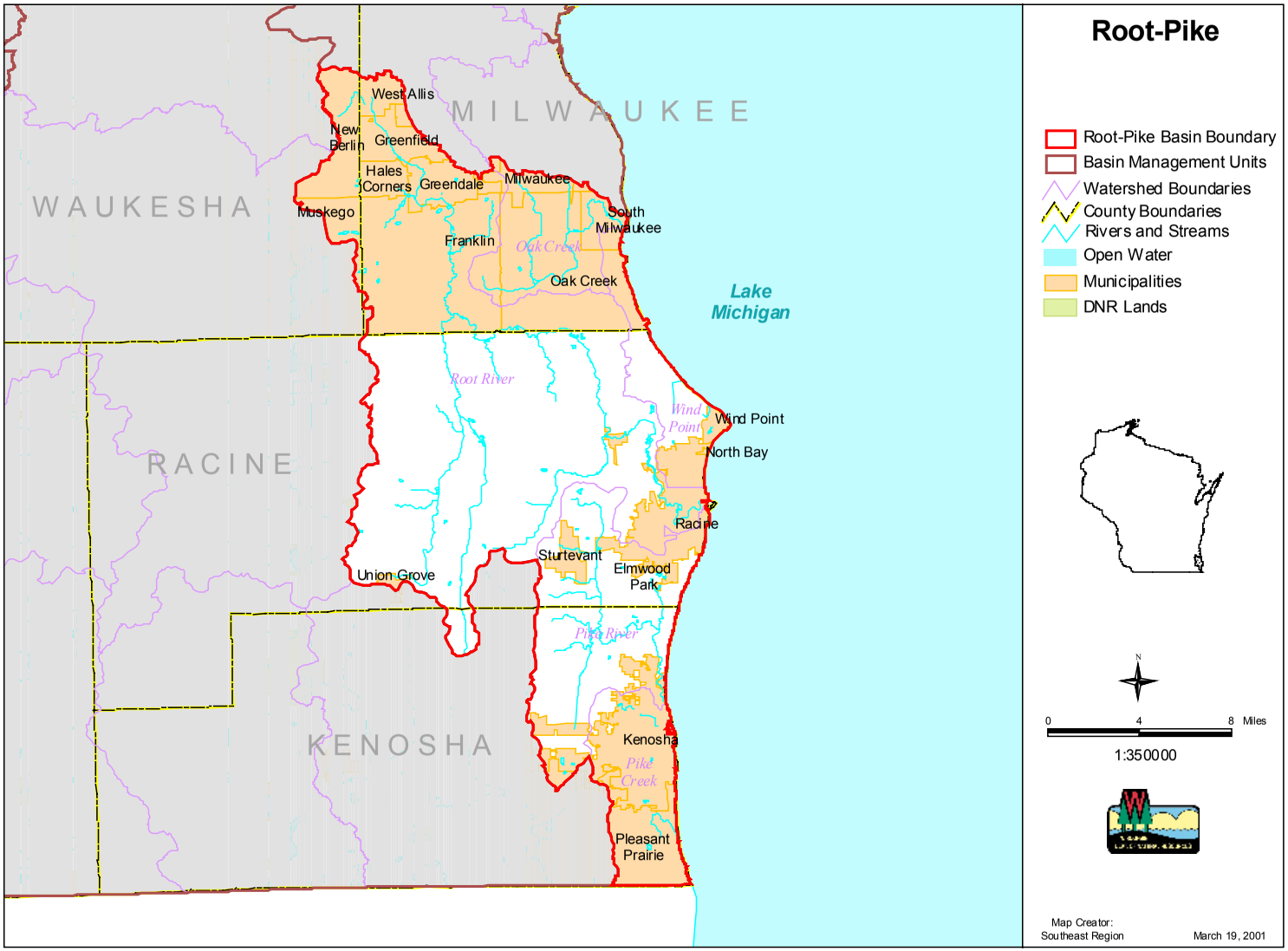
- ✧ Provides an overview of the quality of our land and water resources and our relationships with these resources. **Chapter 1 (page 1), Chapter 2 (page 2), and Chapter 3 (page 25).**

- ✧ Identifies resource issues and threats that keep the land and water resources from meeting their full potential and actions currently underway to address these issues and threats. **Chapter 2 (page 2), Chapter 3 (page 25), Appendix A (page 51), Appendix B (page 63).**

- ✧ Outlines specific actions that the Wisconsin Department of Natural Resources and its many partners can put into practice to improve, protect or maintain the quality of the basin's resources for the next 5 or 6 years. **Chapter 4 (page 47), Chapter 5 (page 47).**

Provides links and references throughout the document so those interested in learning more can readily find the information they're seeking.

Figure 1. Root-Pike River Basin



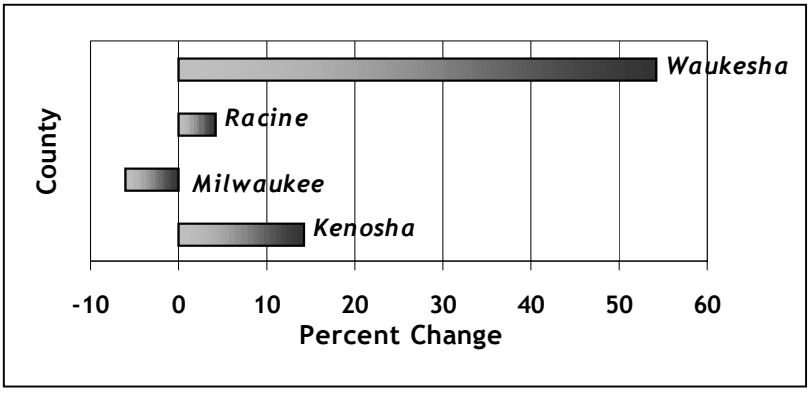
Chapter 1: The Root-Pike River Basin Overview

The Root-Pike River Basin is located in portions of four counties, contains (entirely or portions of) 10 cities, eight towns, eight villages and is home to about 300,000 people. The basin is divided into five watersheds. The watersheds are named after the major rivers they contain, or the areas they drain. Collectively the five watersheds contain about 170 miles of perennial streams, over 300 miles of intermittent streams, five named lakes and many small lakes and ponds. Wetlands encompass over 8,500 acres, or four percent of the basin land area.

The Natural Heritage Inventory (WDNR, 2000) has documented 16 endangered, 20 threatened and 52 special concern plant and animal species and 17 rare aquatic and terrestrial communities within the basin (Appendix C, page 68). The Southeastern Wisconsin Regional Planning Commission (SEWRPC) identified over 3,500 acres of high quality natural communities and critical species habitats remaining in the basin (SEWRPC, 1997). About 20 percent of the land area of the basin is covered by urban uses, while the remainder is considered rural. Agriculture is dominant in the rural areas.

Communities in the Root-Pike Basin have a combined population of about 300,000. Since 1970 the Waukesha County portion of the basin has experienced the most rapid population growth (54% increase) of all the other basin counties (Figure 2). Milwaukee County is the only county in southeastern Wisconsin to experience overall population declines. The Kenosha and Racine County communities have experienced steady growth over the last 30 years.

Figure 2. Percent Population Change in Root-Pike Basin Communities by County: 1970-2000



The next chapters will examine the basin in more detail, including the quality of our water and land resources, issues and resource threats, and recommendations for improvement.

Chapter 2: Root-Pike River Basin Water Resources

The water resources of the Root-Pike River Basin are some of the most degraded in the State of Wisconsin as decades of urban and rural development have left their mark. The majority of wetlands originally present have been drained. Stream modifications like channel manipulation, relocation, and in some cases, enclosures have affected most of the streams in the basin. The combined effects of these modifications have led to degraded water and habitat quality throughout the Root-Pike Basin. This chapter will describe the conditions of the surface water and groundwater resources in the basin as we know them today, identify the threats and challenges to these resources, and outline objectives for the future.

OVERVIEW

The Root-Pike River Basin contains about 196 miles of perennial streams, draining more than 327 square miles of land. Many of the stream miles in the basin are considered full fish and aquatic life streams, meaning they are capable of meeting water quality standards and have the ability to support a full range of fish and aquatic life as habitat and water quality allow. Forty-nine percent of basin stream miles are capable of supporting warm water sport fish communities, and about 21 percent support warm water forage fish communities. Thirty-one percent of stream miles support limited forage fish communities. The remaining four percent of stream miles support only limited aquatic life. There are no cold water communities in the Root-Pike basin, nor are there any streams classified as outstanding or exceptional resource waters.

Streams that do not meet water quality standards on a consistent basis make up about 24 percent of the perennial stream miles in the basin, and include portions of the Root and Pike Rivers and Oak Creek. In response to an U.S. Environmental Protection Agency (U.S. EPA) requirement, the State of Wisconsin maintains a list of impaired waters, also known as the 303(d) list. About 47 miles of rivers are included on this list (Table 1). This list will enable the Wisconsin Department of Natural Resources (WDNR) to set priorities for implementing certain water quality management activities for streams not currently meeting water quality standards. ***For more information about the WDNR impaired waters strategy, please see*** www.dnr.state.wi.us/org/water/wm/wqs/303d.

Table 1. Root-Pike River Basin Streams and Lakes Included on 303(d) List

Waterbody Name	Watershed	Miles affected
Root River (Mile21-43)	Root River	12
Root River (Mouth, upstream to Horlick Dam)	Root River	6.1
Root River Canal	Root River	5.8
Root River Canal West Branch	Root River	4.5
Pike River North Branch	Pike River	4
Oak Creek	Oak Creek	13
Racine Harbor	Root River	
Waxdale Creek	Pike River	2

The following sections give a watershed by watershed perspective of the surface water resources within Root-Pike River Basin. Additional information for each perennial stream and named lake within the basin is included in Appendices A and B (beginning on page 52).

Pike Creek Watershed

The Pike Creek Watershed is located entirely within Kenosha County (Figure 3), and drains portions of the City of Kenosha, the Village of Pleasant Prairie, and the Town of Somers. The watershed actually consists of three sub-watersheds, each draining separately to Lake Michigan. The sub-watersheds are Pike Creek, Barnes Creek, and Tobin Creek. Combined, they drain a total area of 27 square miles. Pike Creek receives the majority of its flow from urban stormwater runoff as it flows eastward through and under the City of Kenosha. Large parts of the stream have been enclosed. Barnes and Tobin Creeks both originate as agriculture drainage, picking up residential runoff before flowing into Lake Michigan.

Urban land uses account for 41 percent of the watershed. Other land uses of the watershed are 20 percent agriculture, 19 percent grassland, nine percent forest, and seven percent wetland. The Pike Creek Watershed has the highest ratio of wetlands to other land uses when compared with other watersheds of the Root-Pike. Municipalities within the Pike Creek watershed are the Village of Pleasant Prairie and the City of Kenosha.

Barnes and Tobin Creeks are partially meeting their biological uses. At last assessment, both supported a varied forage fish community. Currently, Barnes Creek is listed in Chapter NR 104, Wis. Adm. Code. as a variance stream, allowing dissolved oxygen levels as low as 2 mg/L. However, the impending changes to NR 104 will most likely reclassify Barnes Creek as Warm Water Forage Fish stream without the variance. Pike Creek has not been evaluated, and is defaulted as capable of supporting a warm water sport fish community. However, due to urban stormwater runoff and stream enclosure, what fish community that is present is expected to be severely impacted. No streams in this watershed are on the state's impaired waters (303(d)) list.

Fish species found in Pike, Barnes, and Tobin Creek include those tolerant of environmental stressors, such as the common carp, fathead minnow and creek chub. Other species present in these streams include the brook stickleback, golden shiner, northern redbelly dace, black bullhead, and white sucker.

There are no lakes, named or unnamed, within this watershed.

Pike Creek Watershed Recommendations

Following is a list of actions recommended by WDNR staff for monitoring and management in the Pike Creek Watershed.

- Encourage implementation of urban nonpoint source best management practices.
- Encourage implementation of agricultural nonpoint source best management practices, including buffer strip development.
- Conduct baseline surveys on streams within the watershed.
- Assess sediment delivery, sediment transport, and streambank erosion within the watershed.
- Continue to acquire land within the Chiwaukee Prairie project boundary to meet the project goal of 400 acres.
- Protect, restore and manage state lands in the Chiwaukee Prairie Natural Area through controlled burns, brushing and invasive plant removal.
- Work to develp a storm water management plan for the watershed draining to Chiwaukee Prairie.
- Develop a groundwater model for the Chiwaukee Prairie/Carol Beach area to aid the Village of Pleasant Prairie with future development issues and to help with determining the impact of new development on the prairie and Carol Beach residents.

Figure 3. Pike Creek Watershed

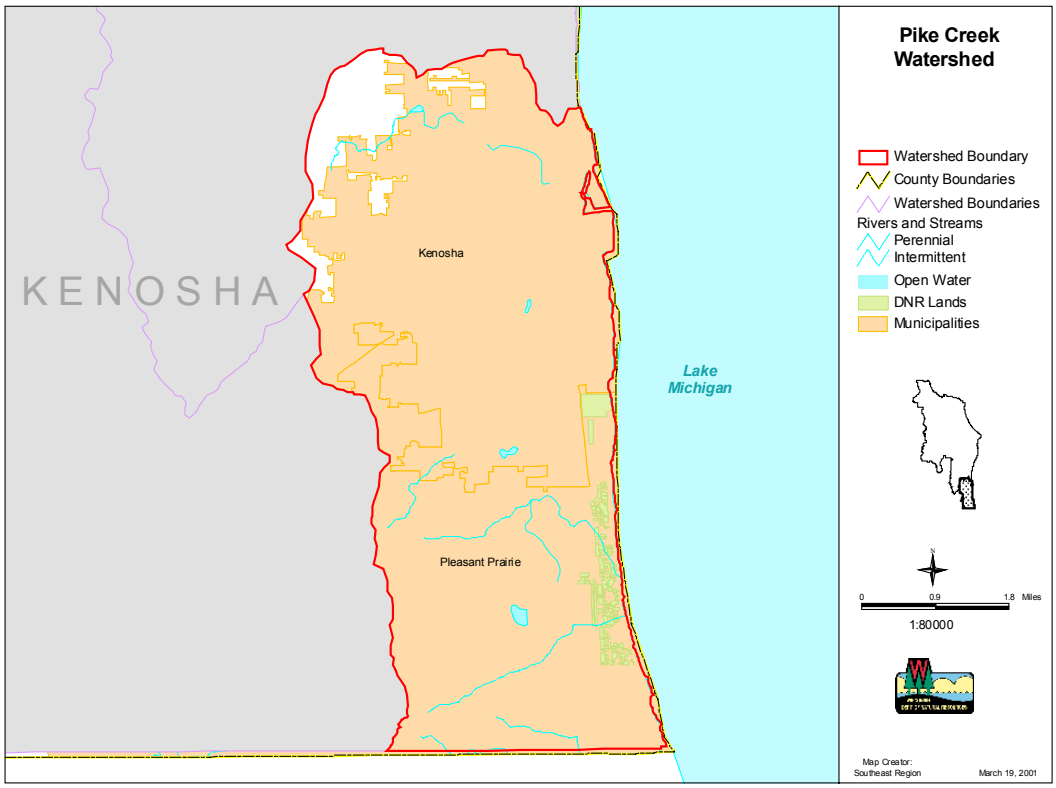


Table 2. Pike Creek Watershed At A Glance	
Watershed drainage area (Square miles)	27
Miles of streams	10.3
Miles of streams listed as outstanding or exceptional resource waters	0
Miles of streams or number of lakes on impaired waters list	0
General threats to stream water quality	▪ Nonpoint sources ▪ Streambank erosion ▪ Hydrological modification (ditching)
Number of named lakes	0
Number of dams	0
Threats to lake water quality	N/A

Pike River Watershed

The Pike River Watershed is located in portions of Racine and Kenosha counties (Figure 4), and consists of three sub-basins; the Upper Pike, Pikes Creek, and the Pike River. The Upper Pike River originates near County Highway C in the Village of Mount Pleasant. Pike Creek is a drainage way that originates near Highway 50 in Kenosha County. From there, it flows north along side the Union Pacific Railroad, picking up contributions from agriculture drainage tiles, Airport Branch, Somers Branch and other unnamed tributaries. The Upper Pike and Pike Creek meet at Petrifying Springs Park, forming the Pike River. From Petrifying Springs, the Pike River flows east, then south through the City of Kenosha before emptying into Lake Michigan. The major tributary to the Pike River is Sorenson Creek.

Land cover is primarily rural, with agriculture dominant (52%). Urban land uses account for 19 percent of the land area, while grasslands (14%) and forests (8%) represent the other major rural uses. Wetlands cover less than two percent of the land area. The municipalities include the City of Kenosha, the Village of Sturtevant, and the Towns of Somers and Mount Pleasant.

The water quality of the 42 miles of rivers and streams in the Pike River Watershed ranges from severely degraded to good. Twenty-one miles of perennial streams (50%) are currently considered to support a Warm Water Sport Fish community. Eight miles (19%) support a Warm Water Forage Fish community. About eight miles (18%) of streams in the basin support a Limited Forage Fish community. Six miles of streams in the Pike River Watershed are listed on the state's impaired waters (303(d)) list. These streams are the Upper Pike River and its tributary, Waxdale Creek, in the Town of Sturtevant.

Fish species found in the Pike River Watershed include yellow perch, southern redbelly dace, blacknose dace, bluegill, and largemouth bass. In addition, steelhead salmon, brown, and brook trout are present due to Lake Michigan stocking efforts. Tolerant fish species found in the watershed include the creek chub, fathead minnow, and green sunfish.

The one named lake found in this watershed is Petrified Springs Park Pond, which covers approximately three acres. Appendix B, (page 63) has more information about this named lake.

One major ongoing project that will impact the Pike River Watershed concerns the Mount Pleasant Drainage District #1. The District was recently issued a permit from the WDNR to reconstruct approximately 5.5 miles of the Pike River in the Town of Mount Pleasant, Racine County. The goals of this project are to remove the threat of flooding from several structures and roads in the township, and to improve water quality and fish habitat within the Upper Pike River. Elements of the project include protecting wetlands, installing buffer strips along the river and establishing an environmental corridor. Construction is slated to begin in 2002 and should take a minimum of 10 years to complete at a cost exceeding $17,000,000.

Pike River Watershed Recommendations

Following is a list of actions recommended by WDNR staff for monitoring and management in the Pike River Watershed.

- Encourage implementation of urban nonpoint source best management practices.
- Encourage implementation of agricultural nonpoint source best management practices, including buffer strip development.
- Conduct baseline surveys on streams within the watershed.
- Assess sediment delivery, sediment transport, and streambank erosion within the watershed.
- Monitor and evaluate Pike River Improvement Project impacts.

- Conduct aquatic habitat and sediment assessments above and below dams on the Pike River.
- Evaluate Petrifying Springs and Kenosha Country Club dams for removal.
- Evaluate and implement aquatic habitat restoration and water quality improvement practices where practicable.
- Evaluate and implement wetland restoration projects where practicable.

Figure 4. Pike River Watershed

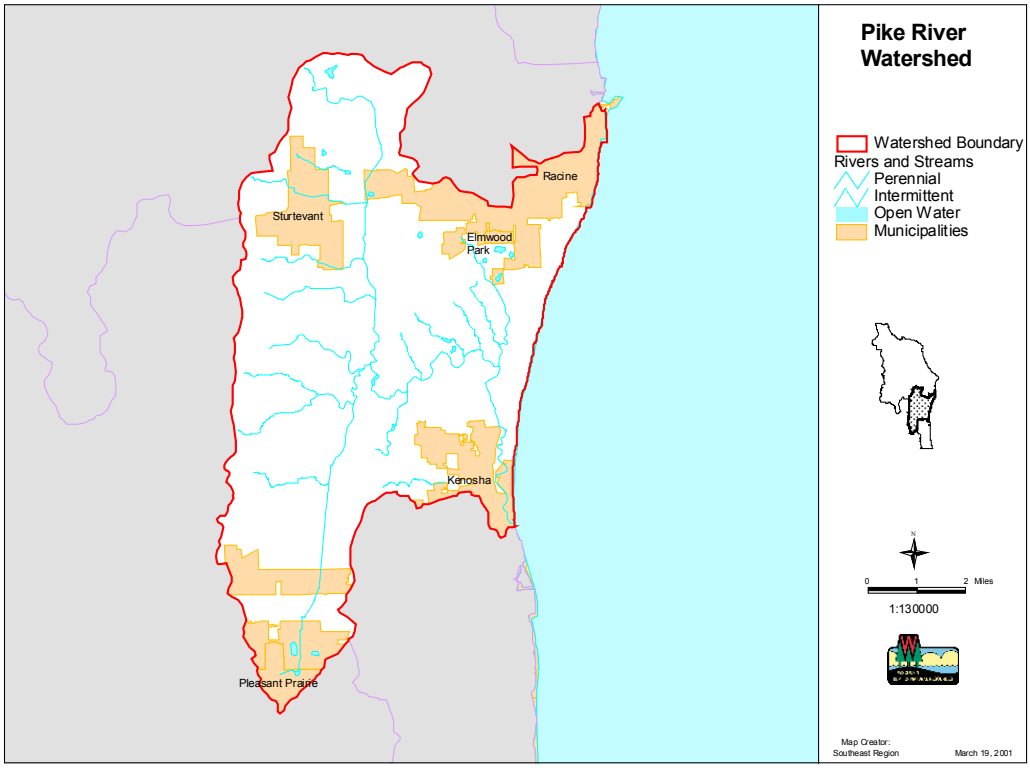


Table 3. Pike River Watershed At A Glance	
Watershed drainage area (Square miles)	56.5
Miles of streams	42.5
Miles of streams listed as outstanding or exceptional resource waters	0
Miles of streams or number of lakes on impaired waters list	6
General threats to stream water quality	▪ Hydrological modification (ditching) ▪ Urban runoff ▪ Stream bank erosion
Number of named lakes	1
Number of dams	2
Threats to lake water quality	▪ Sedimentation

Root River Watershed

The Root River Watershed is located in portions of Waukesha, Milwaukee, and Racine counties (Figure 5), and drains almost two-thirds of the entire Root-Pike River Basin (198 square miles). Nine sub-watersheds contribute flow: the Upper Root, Whitnall Park Creek, East Branch, Lower Root, Middle Root, Root River Canal, West Branch Root River Canal, East Branch Root River Canal, and Hoods Creek. There are a total of 117 miles of rivers and streams in the Root River watershed.

The headwaters begin in west central Milwaukee and eastern Waukesha counties. From there, the river flows southeast, picking up contribution from eight sub-watersheds, and ultimately emptying into Lake Michigan in the City of Racine. Each sub-watershed serves a different land use. The Upper Root is heavily urbanized. Whitnall Park Creek and the East Branch drainage areas are changing from mixed residential/agriculture to strictly residential as Milwaukee County is further developed. The Root River Canal system, the Middle Branch of the Root, and Hoods Creek primarily drain agricultural land.

The Root River Watershed ranges from heavily urbanized at the headwaters and mouth, to agricultural use in the middle drainage area, and back to urban near the City of Kenosha. All told, agricultural use dominates land usage, at 49 percent, followed by grassland at 16 percent. Urban land uses cover about 14 percent of the land area. The remaining land uses consist of five percent wetland, and five percent barren and shrubland. Municipalities within the Watershed include: the Cities of Franklin, Greenfield, Milwaukee, Oak Creek, West Allis, Racine, New Berlin, and Muskego; the Towns of Paris Caledonia, Dover, Mt. Pleasant, Raymond, and Yorkville; and the Villages of Greendale, Hales Corners, and Union Grove.

The water quality of the 117 miles of rivers and streams in the Root River Watershed ranges from severely degraded to good. Fifty-nine miles of perennial streams (50%) are currently supporting a Warm Water Sport Fish community. Eighteen miles (15%) support a Warm Water Forage Fish community. Eighteen miles (15%) of streams in the basin support a Limited Forage Fish community. One four mile stretch of stream, the East Branch, is considered Limited Aquatic Life (due for a classification revision). Twenty-eight miles of streams in the Root River Watershed are listed on the state's impaired waters (303(d)) list. These streams include the Root River from the Racine Harbor, upstream to Horlick Dam, the West Branch of the Root River Canal, the Root River Canal, and 12 miles of the Root River mainstem.

The fish species found in the Root River Watershed reflect the range of water quality found amongst the different watersheds. At the mouth of the Root River upstream to the Horlick Dam, seasonal runs of stocked Chinook salmon, coho salmon, brown trout and rainbow trout (steelhead) present a challenging fishery. Other sport fish are caught upstream, including northern pike and largemouth bass. The forage fish population is equally diverse, and includes the common shiner, blackside darter, bluntnose minnow, black bullhead, brook stickleback, and johnny darter. And as may be expected, pollution tolerant fish species like the common carp, fathead minnow, central mudminnow, creek chub, white sucker, and green sunfish are also present in the Root River Watershed.

Twelve named lakes are found in this watershed ranging in size from 20 acres (Quarry Lake) to one acre (Boerner Botanical Garden Pond #2). Appendix B (page 63) has more information about the named lakes in this watershed. The majority of lakes within the Watershed are part of the Milwaukee County Park system.

Root River Watershed Recommendations

Following is a list of actions recommended by WDNR staff for monitoring and management in the Root River Watershed.

- Encourage implementation of urban nonpoint source best management practices.
- Encourage implementation of agricultural nonpoint source best management practices, including buffer strip development.
- Conduct baseline surveys on streams within the watershed.
- Assess sediment delivery, sediment transport and streambank erosion within the watershed.
- Evaluate, assess and improve aquatic and riparian habitat in cooperation with the Milwaukee Metropolitan Sewerage District and their ongoing Flood Management Improvement Projects.
- Conduct aquatic habitat and sediment assessments above and below the Horlick dam.
- Evaluate the Horlick dam for removal.
- Evaluate Hoods Creek dam for removal.
- Evaluate and implement aquatic habitat restoration and water quality improvement practices where practicable.
- Evaluate and implement wetland restoration projects where practicable.
- Assess impacts and improvements to water quality within communities subject to NR 216 Municipal Storm Water Permitting requirements.

Figure 5. Root River Watershed

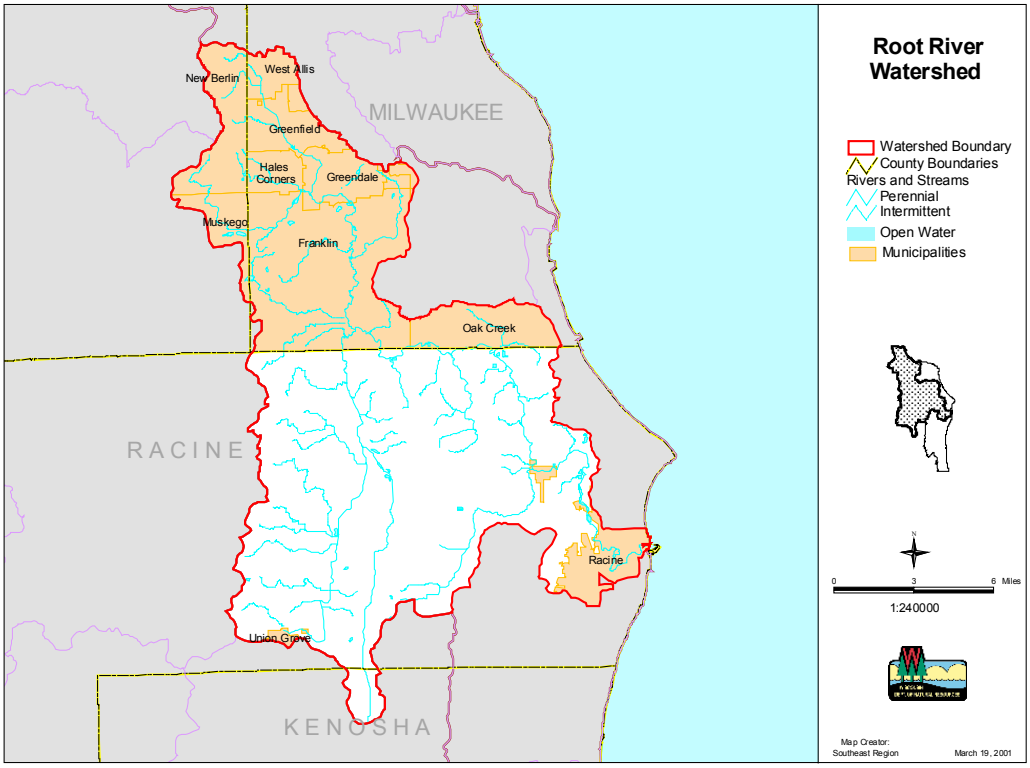


Table 4. Root River Watershed At A Glance	
Watershed drainage area (Square miles)	197
Miles of streams	117
Miles of streams listed as outstanding or exceptional resource waters	0
Miles of streams or number of lakes on impaired waters list	28.4
General threats to stream water quality	▪ Stream and wetland modification ▪ Hydrological modification ▪ Urban runoff ▪ Streambank erosion ▪ Point Sources
Number of named lakes and ponds	12
Number of dams	2
Threats to lake water quality	▪ Urban Runoff ▪ Sedimentation ▪ Excessive nutrients

Wind Point Watershed

The Wind Point Watershed is located in the extreme eastern portion of Racine County, north of the City of Racine, around the Village of Wind Point (Figure 6). Two unnamed perennial tributaries, totaling 4.4 miles, receive runoff from the watershed and drain a combined area of almost 19 square miles.

Land cover for the Wind Point Watershed is pretty evenly split between urban and rural. Urban land uses account for 36 percent of the water basin. Rural uses include 20 percent grassland, 19 percent agriculture, and 14 percent forest. Other uses include shrubland (4%), and wetland (2%). Municipalities found in this watershed include the Village of Wind Point, portions of the City of Racine, and the Towns of Caledonia and Mount Pleasant.

The two unnamed streams within the watershed support forage fish communities, one rated Warm Water Forage Fish, the other Limited Forage Fish. No water bodies within the Watershed are listed on the state's impaired waters (303(d)) list.

There are no lakes within the Watershed.

Wind Point Watershed Recommendations

Following is a list of recommendations for monitoring and management within the Wind Point watershed.

- Encourage implementation of urban nonpoint source best management practices.
- Encourage implementation of agricultural nonpoint source best management practices, including buffer strip development.
- Conduct baseline surveys on streams within the watershed.
- Assess sediment delivery, sediment transport, and streambank erosion within the watershed.
- Evaluate and implement aquatic habitat restoration and water quality improvement practices where practicable.
- Evaluate and implement wetland restoration projects where practicable.

Figure 6. Wind Point Watershed

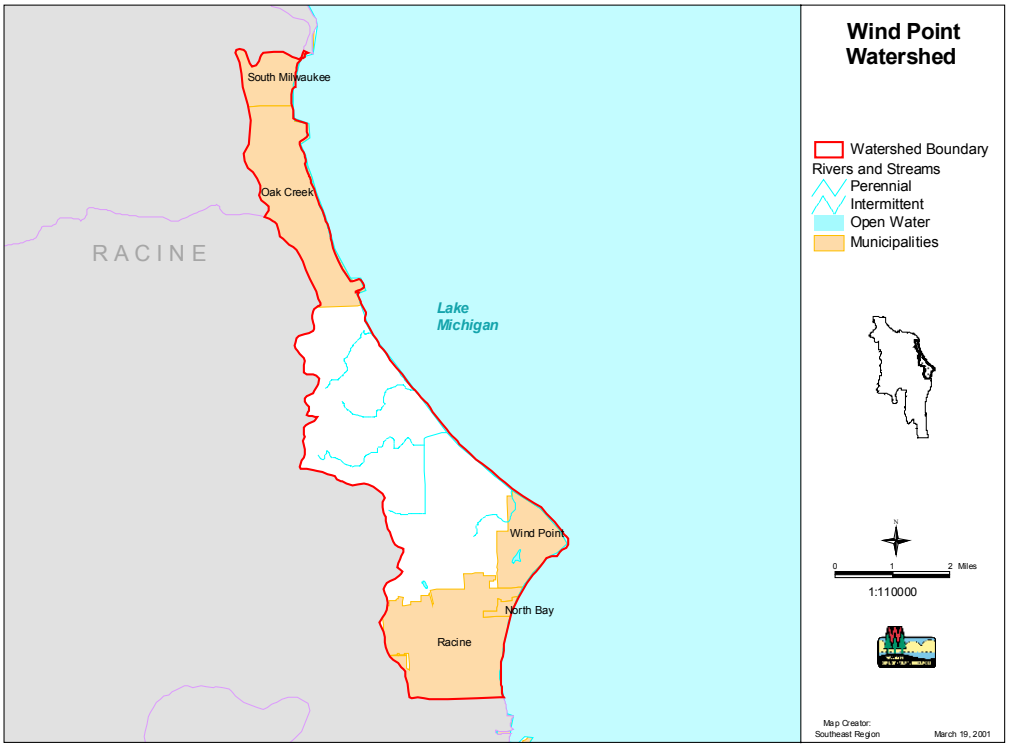


Table 5. Wind Point Watershed At A Glance	
Watershed drainage area (Square miles)	18.7 miles
Miles of streams	4.4 miles
Miles of streams listed as outstanding or exceptional resource waters	0
Miles of streams or number of lakes on impaired waters list	0
General threats to stream water quality	▪ Urban runoff ▪ Hydrological modification
Number of named lakes	0
Number of dams	0
Threats to lake water quality	N/A

Oak Creek Watershed

The Oak Creek Watershed is located entirely within Milwaukee County (Figure 7). Oak Creek originates in the City of Franklin, with the majority of flow contributed by urban runoff. As it makes its way east, Oak Creek receives flows from the North Branch and the Mitchell Field Drainage Ditch. In South Milwaukee, Oak Creek meanders through to Grant Park, and ultimately into Lake Michigan. The stream drains about 26 square miles.

Principal land cover in the Oak Creek Watershed is a mix of urban and grassland (38% and 32% respectively). The remaining land uses include agriculture (11%), Forest (14%) and Wetland (3%). Oak Creek drains portions of the Cities of Greenfield, Franklin, Oak Creek, South Milwaukee, and Milwaukee.

The historic impacts of channelization, toxics, and hydrological modification have combined with urban runoff and stream bank erosion to degrade the water and habitat quality of Oak Creek. Of the total combined length of 21.2 miles, 13 miles, or 61% are listed on the State's impaired waterbody 303(d) list. The factor influencing inclusion on the list is the toxic levels of contaminants found in contaminated sediments.

Fish species found in the Oak Creek Watershed include the white sucker, black bullhead, brook stickleback, and largemouth bass. In addition, rainbow (steelhead), brown, Chinook salmon, coho salmon and brook trout are present to the mill dam in Grant Park due to Lake Michigan stocking efforts. Tolerant fish species found in the Watershed include the creek chub, fathead minnow, central mudminnow, golden shiner, and green sunfish.

The one named lake found in this watershed is the Oak Creek Parkway Pond, an impoundment created by the Old Mill Dam, located in Grant Park in South Milwaukee. The Pond is 5 acres in size. Appendix B, (page 63) has more information about this pond.

Oak Creek Watershed Recommendations

Following is a list of actions recommended by WDNR staff for monitoring and management within the Oak Creek Watershed.

- Encourage implementation of urban nonpoint source best management practices.
- Encourage buffer strip development for stream bank stabilization
- Conduct baseline surveys on streams within the watershed.
- Assess sediment delivery, sediment transport, and stream bank erosion within the watershed.
- Evaluate, assess and improve aquatic and riparian habitat in cooperation with MMSD and their ongoing Flood Management Improvement Projects.
- Conduct aquatic habitat and sediment assessments above and below the Old Mill dam and the Oak Creek drop structures.
- Evaluate the Old Mill dam and Oak Creek drop structures for removal.
- Evaluate and implement aquatic habitat restoration and water quality improvement practices where practicable.
- Form partnerships with schools and community organizations to assess ad improve the water quality of Oak Creek.
- Assess impacts and improvements to water quality within communities subject to NR 216 Municipal Storm Water Permitting requirements.

Figure 7. Oak Creek Watershed

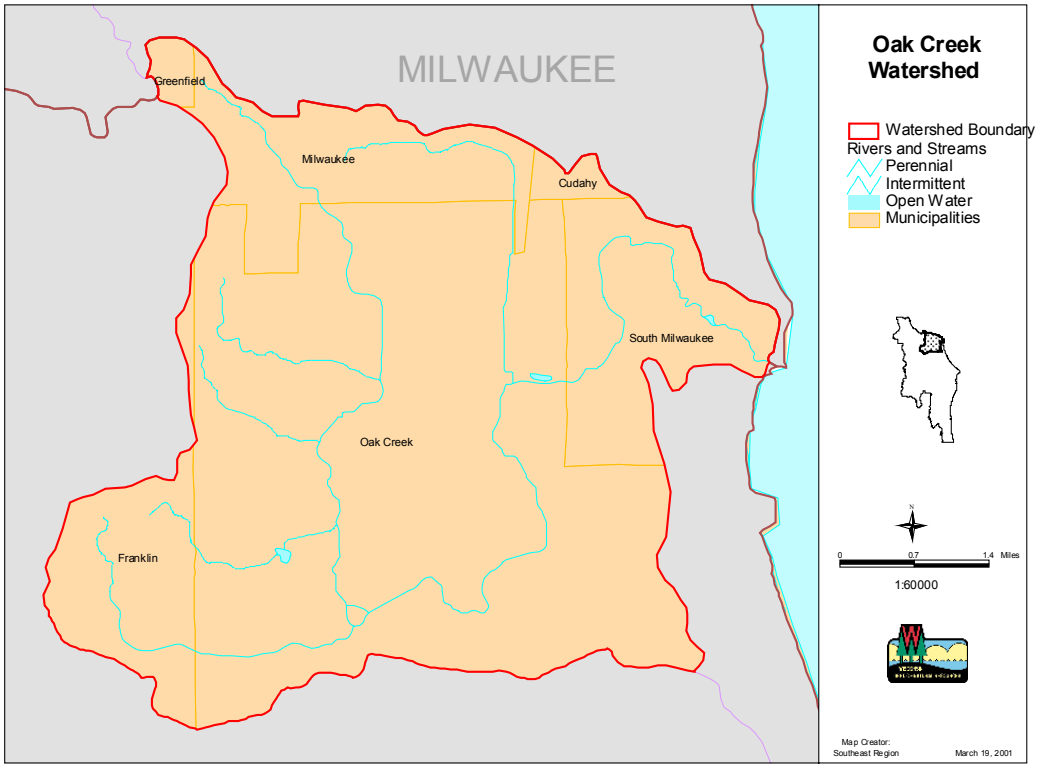


Table 6. Oak Creek Watershed At A Glance	
Watershed drainage area (Square miles)	26.2 miles
Miles of streams	21.2 miles
Miles of streams listed as outstanding or exceptional resource waters	0
Miles of streams or number of lakes on impaired waters list	13 miles
General threats to stream water quality	Urban Runoff Toxics Hydrological modification Stream Bank Erosion
Number of named lakes	1
Number of dams	1
Threats to lake water quality	Nutrient enrichment Sedimentation

CHALLENGES TO SURFACE WATER QUALITY

Surface and groundwater resource quality in the Root-Pike River Basin is mostly affected by the way we use the land. As population increases and rural lands are converted for homes and business, pollution sources to surface and groundwater increase while habitat and water quality degrades. Streams and lakes with degraded water quality tend to have high populations of a few tolerant species like common carp that are capable of adapting to extremes. In contrast, stable systems generally have a higher diversity of species of all tolerance levels.

Pollutants to surface waters come from a single point of origin (point sources), or through many different, or diffuse areas (nonpoint sources). Point sources of pollution are usually associated with industrial discharges or municipal wastewater treatment plants, while nonpoint sources of pollution are associated with materials running off the land and into surface waters. Stormwater is considered both a point and nonpoint source of pollution. Areas with curbs and gutters generally have storm sewer systems that keep the water from pooling on streets, parking lots, rooftops and other areas. Rainfall that runs off of many different areas is often collected in a storm sewer system and ultimately discharged at a single point to a stream or lake. In many areas buildings, parking lots, farm fields and pastures come very close to the waters edge which can negatively affect water quality and habitat for wildlife.

One pollutant that is common in both point and nonpoint sources is phosphorus. Excess phosphorus in freshwater systems causes a chain reaction of events that stresses the whole ecosystem. The nutrient causes plants and algae to multiply. In some areas where shading is limited, these plants can multiply to levels which cause extreme shifts in dissolved oxygen content in the water column. During the day the plants, without shade, multiply and produce oxygen which can supersaturate the water column. In the evening these same plants respire and use the oxygen, along with the other living organisms. Because of their sheer biomass, the plants use a lot of oxygen at night, and cause the concentration in the water to drop to very low levels. The large changes in dissolved oxygen concentrations are detrimental to fish and other species that require a more stable oxygen supply.

The following sections will describe the major sources of pollutants to surface water quality in the basin, followed by actions that should be taken to eliminate or minimize the effects.

Industrial and Municipal Point Sources of Pollution

Within the Root-Pike River Basin there are 431 industrial point sources, and 12 municipal point sources of pollutants to surface and groundwater resources. Industrial point sources are designated as either specific or general. Specific permits are issued to industries that have discharge requirements unique to their site. Of the total number of industrial dischargers, those with specific permits account for about two percent. Over 70 percent of the industrial point sources are from industrial stormwater sites and construction sites which are discussed in the stormwater section (beginning on page 17).

General permits are given to industries for discharges that can be broadly categorized and regulated with standard conditions such as non-contact cooling water. This is not water mixed into materials to process a particular product, but rather water that is used to cool machinery. Non-contact cooling water accounts for about nine percent of the discharge permits in the basin. Wastewater discharged under these general permits has characteristics of the municipal water supplies, which often contains phosphorus (orthophosphate or polyphosphate) added by the water utility which prevents lead and copper from leaching into drinking water supplies. Phosphorus is also used to keep iron in solution so it does not deposit on plumbing fixtures. As a result, many single pass cooling

water discharges have become new sources of phosphorus to surface waters. The total amount of phosphorus entering streams from non-contact cooling water discharges has not been calculated for rivers in the basin, so the extent of these inputs compared to nonpoint sources of phosphorus is not known.

Municipal wastewater treatment plants and some industries have specific permits for their waste treatment and discharge activities. These specific permits are tailored to each facility, and limit the amount of pollutants that can be discharged depending on the size and quality of the receiving water. As a requirement of these permits, the facility must report to the WDNR the amount of flow and pollutants discharged. In the Root-Pike Basin, municipal treatment plants discharge over 56 million gallons a day of treated effluent.

Sanitary sewer overflows (SSOs) and combined sewer overflows (CSOs) to surface waters throughout the state have been receiving increased attention within the last two years. Combined sewer systems are unique to a portion the Milwaukee Metropolitan Sewerage District, and the City of Superior. Sewer overflows do occur statewide, but the large size and character of the sewerage system serving the Milwaukee metropolitan area has focused scrutiny on the southeastern part of the state. Overflows generally occur during periods of intense rainfall, but mechanical failure or other circumstances can lead to the release of untreated sewage to surface waters.

Sanitary sewers, such as those in the Root-Pike River Basin, are designed to carry sewage from residences, commercial buildings, industries and institutions to a treatment facility. Sanitary sewers carry mainly sewage, but some groundwater and storm water leak unintentionally into the sewers through cracks. When a sewer system does not have the capacity needed to carry sewage and the water leaking into the sewers, the system is built to relieve itself by discharging the excess, a sanitary sewer overflow. The excess can end up in basements through sewer backups, in the streets through overflowing manholes, or to nearby surface waters through gravity overflow or pumping.

We should be concerned about these overflows to surface waters for many reasons. Aside from being aesthetically objectionable, untreated sewage can be damaging to the environment and human health. Pollutants like excess solids, nutrients, and toxic substances are found in untreated sewage, and can have a direct effect on water quality, habitat, fish and wildlife. The pathogens found in sewage such as certain types of bacteria, viruses and protozoa can put humans that ingest these organisms at risk. Some skin rashes can also occur from contact with certain water-borne pathogens. State and Federal laws and regulations are intended to prohibit the discharge of untreated sanitary sewage to minimize these risks to the public.

The Wisconsin Department of Natural Resources submitted a report to the Natural Resources Board addressing the issues surrounding sanitary sewer and combined sewer overflows. The report (WDNR, 2001) contains a series of recommendations to be implement by the WDNR and communities throughout the state to address this issue. ***For more information, a copy of the full report to the Natural Resources Board is available on the Internet at*** www.dnr.state.wi.us/org/water/wm/ww/so.

Nonpoint Sources of Pollution

Most nonpoint sources of pollution to surface waters can be designated as either rural or urban in origin. Some sources, such as eroding streambanks and construction site erosion are found in both urban and rural areas. In rural areas nitrogen, phosphorus, bacteria and soil are the major nonpoint pollutants. These pollutants as well as metals and other man-made compounds are found in urban runoff. The following sections will highlight the major sources of runoff pollution and the environmental consequences of these pollutants in rural and urban areas.

Rural

Rural nonpoint sources are often, but not always associated with agricultural operations. Barnyards, feedlots, farm fields and direct livestock access to surface waters are the major agricultural sources of runoff to basin surface and groundwater resources and wetlands. Eroding farm fields, streambanks and construction sites also contribute soil and associated pollutants to surface waters and wetlands.

Barnyards and livestock feeding and pasture areas carry significant amounts of nutrients, solids and bacteria to surface waters. Excess nutrients, like phosphorus and nitrogen in surface waters, can lead to excessive plant growth which in turn leads to extreme fluctuations in dissolved oxygen concentrations. Widely fluctuating dissolved oxygen concentrations are detrimental to sensitive fish and other aquatic species that depend on a consistent level of water quality. Streams exhibiting these fluctuations support tolerant fish species such as common carp, yellow bullhead and fathead minnows which are less sensitive to extremes in oxygen concentrations.

Soil erosion from adjacent farm fields, streambanks and construction sites add to the sediment load in streams. This soil settles to the bottom of streams and often covers the rocky and gravely areas needed for many invertebrate and fish species to survive. Only the hardiest species are able to thrive in streams with sediment covering the bottom.

Livestock manure is a cause of high bacteria, nutrient and solids concentrations in water bodies adjacent to agricultural lands. Manure is delivered to streams by direct access of livestock to streams, feedlot runoff, and inadequate manure management. Failing septic systems can also increase bacteria concentrations in streams. Most small farms have enough land on which to properly spread manure. For those that do not, manure storage is an option that landowners can exercise. Farms containing at least 1000 animal units (one animal unit equals a 1000 pound steer) are considered concentrated animal feeding operations (CAFOs) and must receive a permit from the WDNR for meeting specific manure management standards.. ***For more information on manure management and WDNR regulations, please contact the Southeast Region Animal Waste Specialist at (414) 263-8625.***

Urban

The pollutants found in urban stormwater are different than in rural runoff. Sediment runoff is a major concern in urban areas, but the particles making up sediment contain more than soil and nutrients. Although soil is the largest component of urban sediment, it also contains metal from cars, trucks and rooftops, particles from vehicle exhaust, pieces of pavement, and fallout from chimneys and industrial smokestacks, which make it more toxic.

Most of the sediment load to streams in urban areas comes from active construction sites (USGS, 2000; UWEX, 1997). Based on research in Dane County, Wisconsin, the sediment yield from construction sites with no erosion controls in place is about 15 tons per acre per year (Roa, 2000). The WDNR has the authority to oversee construction activity on sites greater than five acres in size, while the Wisconsin Department of Commerce regulates construction activities on smaller lots. As of July 1, 2000, there were 154 active WDNR permitted construction sites in the Root-Pike River Basin. The total land disturbance permitted was 2733 acres with an average land disturbance of 18 acres per construction site (range of five –111 acres). Residential construction accounted for 65 percent of the active WDNR permits, with commercial (11%), other (recreational, institutional, governmental-10%), industrial (3%), and utility (10%) rounding out the list. If permit requirements are followed at these construction sites, the sediment yield can be reduced by 80 percent (Wood, 2000).

Based on inspection of permitted construction sites by WDNR staff, it is unlikely that the permitted construction sites in the Root-Pike River Basin are achieving a sediment yield reduction of 80

percent. Similar to experiences reported by other states (Brown and Caraco, 2000), WDNR staff find erosion control problems at most construction sites. Typical problems include failure to develop appropriate plans, failure to implement plans, and failure to maintain erosion controls. A particular problem is the common practice of stripping topsoil from the entire construction site which leaves large areas of exposed subsoil susceptible to erosion. Better timing of construction activities throughout a site will reduce the potential for erosion.

Many communities are also responsible for controlling runoff from areas within their municipal boundaries. Eight communities within the Root-Pike River Basin are required by U.S. EPA and WDNR to implement measures to improve the quality of storm water entering area rivers. The communities must determine the pollutant loads from their runoff and propose management programs to reduce the amounts of pollutants entering waterways. Methods to reduce pollutants at their source are preferred to those that treat polluted runoff. Some of the activities communities are implementing are construction site erosion control and stormwater ordinances, aggressive street sweeping and catch basin cleaning schedules, sediment basins, illicit connection field screening, and information and education programs.

For more information on stormwater and construction site programs in the Root-Pike Basin, please contact the Municipal Stormwater Management Coordinator at (414) 263-8682. See the U.S. EPA web site (www.epa.gov/ost/stormwater***) for stormwater management practices and their effectiveness in removing pollutants.***

Some industries are required to comply with stormwater permit rules. The types of industries required to receive industrial stormwater permits include many heavy manufacturers, light manufacturers, transportation facilities and mining, oil and gas operations. In the Root-Pike River Basin 122 facilities are permitted under the industrial stormwater permitting program. Facilities receiving permits are required to identify best management practices for their facility to prevent contamination of stormwater. The facilities are also required to maintain records of inspections to verify these practices are in place and working.
For more information on industrial stormwater permits in the Root-Pike River Basin, please contact the Industrial Stormwater Management Coordinator at (262) 884-2362.

Contaminated Sediments

Contaminated sediments are a concern in urban and industrial areas of the Root-Pike River Basin. Many pollutants cling to sediment particles and eventually settle on river and lake bottoms, forming sediment deposits. These deposits serve as a sink for a variety of pollutants, allowing them to collect at elevated levels. When sediment is disturbed through biological, hydrological or human activity, these toxicants can return to the water column and be taken up by fish and other organisms. Some pollutants no longer in use, such as polychlorinated biphenyls (PCBs), can remain in sediments for long periods of time. Over time, fish and other organisms exposed to PCBs accumulate these substances in their bodies, often at extremely elevated levels.
For information about fish consumption advisories, please see the publication, Important Health Information For People Eating Fish From Wisconsin Waters, which is published annually by the Wisconsin Division of Health and the WDNR, or visit the WNDR Fish Consumption Web site at www.dnr.state.wi.us/org/water/fhp/fish/advisories.

Stream and Shoreline Modification

Stream and shoreline modifications are common occurrences throughout the Root-Pike River Basin. Small headwaters streams were ditched to facilitate drainage for agriculture or to supply water for irrigation. Land was often cleared right up to the streambanks to obtain forest products and to

maximize the amount of land in agricultural production. Floodplain development and increases in impervious surfaces in urban areas have led to stream channel deepening, straightening and concrete lining to move stormwater off the land and downstream more swiftly. Dams built to perform specific purposes also have noticeable effects of stream ecosystems. This section will briefly touch on the loss of stream corridor habitat, channel modifications and their effects.

Floodplain Development

Flooding is a natural occurrence in all stream ecosystems. The once common practice of floodplain development and resultant loss of wetlands decreases the natural function of the floodplain to store flood waters. The floods of 1997 and 1998 in Southeastern Wisconsin have increased attention for finding solutions to the problems associated with flooding. One way to address this issue is to increase flood water storage through incorporating stormwater detention on newly developed areas, and building detention into redeveloping and developed areas where feasible. Creating more open space along our streams allows for more floodplain storage and improves the environmental corridor along our streams. Restricting floodplain development is also key to minimizing damage from floodwaters.

Dams

The rivers, ponds and some wetlands in the Root-Pike River Basin contain about eight dams of varying size and function. Regardless of size, dams can have profound effects on stream ecosystems. Dams can change once flowing streams into bodies of water more resembling lakes. Dams displace the species that thrive in a flowing environment. Dam structures prevent or slow migration of fish and other aquatic life within the stream ecosystem thereby having effects throughout the food chains in the stream.

Streams rely on periodic high flows to move sediment. Dams can dampen that effect. Instead of being suspended in the water column and depositing at river bends, sediments get backed up behind dams and cover the gravel areas many species rely on for reproduction and habitat. Dam allow for the water upstream of the dam to warm, which can have a negative effect on species sensitive to temperature fluctuations, and attract tolerant rough fish such as carp.

Stream Corridor Modification

The corridor area adjacent to a stream is a very important part of the stream ecosystem that benefit water quality and wildlife. Prior to intensive development, most of the streams in the Root-Pike River Basin were lined with trees or tall grasses. As lands were cleared, agriculture and urban development along rivers soon took the place of the natural wildlife corridors adjacent to the rivers. Water quality also declined as the streams lost the benefit of shading and soil retention that the vegetation along streams provided.

Trees, shrubs and grasses provide shade to keep the water cool, stabilize streambanks, filter runoff, and attract insects that wildlife feed on and creates resting and nesting areas. Trees that fall into the water provide cover for fish and basking areas for snakes and turtles.

The corridor adjacent to streams also provides important travel routes for many wildlife species. Without these continuous wildlife "highways" habitat becomes fragmented and wildlife populations often decline.

The Natural Resources Conservation Service (NRCS), the WDNR, the US Fish and Wildlife Service and many others have recognized the importance of restoring stream corridors to benefit aquatic and terrestrial life and water quality. These agencies have programs to assist landowners willing to protect and restore stream corridors. ***For more information please see*** www.nrcs.usda.gov/ ***or call your local WDNR office.***

Water Quality of Lake Michigan Swimming Beaches

Water quality at Lake Michigan swimming beaches has garnered a lot of attention from the media, politicians, and concerned citizens over the past several years. Driving much of the attention is the fact that many area beaches have been closed on a more frequent basis over the past few years. For example, the City of Racine's North Beach was closed 62 days in 2000.

In 2000, the Southeast Wisconsin Beach Task Force was formed to address concerns about the water quality at area beaches. The group's mission is:

> *"The pursuit of safe and healthy water conditions at Southeastern Wisconsin coastal beaches through a collaborative effort in coordinating research, implementing best management practices, and successful public outreach."*

The ultimate goal is to determine the sources of the bacterial pollutants responsible for the beach closures, and to develop and encourage measures to reduce or eliminate these pollutants.

Research is currently under way by members of the Task Force, and will provide some clues about the sources of bacterial contamination at area beaches. Some of the work currently under way in our region includes the Racine Interstitial Sand Beach Study, looking at whether *E. coli* bacteria (an indicator organisms) can survive or reproduce in beach sands, and methods to limit incubation and growth of these organisms and associated pathogens.
For more information about the Southeast Wisconsin Beach Task Force and Task Force study results, please see www.legis.state.wi.us/assembly/asm19/news/beach_task_force.htm.

DRINKING WATER AND GROUNDWATER IN THE ROOT-PIKE RIVER BASIN

Groundwater supplies water to about 17 percent of basin residents for residential and commercial use. The remaining 83 percent of the basin's population, centered around the Cities of Racine, Kenosha, Oak Creek and South Milwaukee rely on water pumped from Lake Michigan.

Groundwater and Drinking Water Supplies

Groundwater under the basin comes from three main aquifers, the sand and gravel, dolomite and sandstone. The sand and gravel aquifer is the shallowest of the three aquifers, with an average depth of 100 feet. This aquifer is limited over much of the basin due to thick clay soils, but is available in select areas where bands of gravel are buried, or alluvial valleys where gravel and sand deposits formed. The medium depth aquifer, the Silurian dolomite (or Niagara Limestone) has an average thickness of 500 feet throughout most of the basin. It is the chief aquifer for residential and medium capacity commercial properties. The sandstone aquifer is the deepest, and is used for high capacity utility and commercial purposes, with well depths ranging down to 2000 feet.

Lake Michigan is the source of drinking water for most of the municipal water treatment plants. Four municipal water treatment plants sell their treated drinking water retail and wholesale to eight communities resulting in a complex of consecutive public water systems serving just over 250,000 people.

Drinking Water System Types

Drinking water systems are described by the WDNR and regulated according to the type of population they serve, mainly private and public (Table 7). The private well is the most prevalent of the groundwater systems, with about 14,000 wells in the basin. Private wells serve mainly homes and small businesses where fewer than 25 people per day have access to water. Today, although the most numerous of system types, private wells serve only 17 percent of the basin's population (about 43,000 people). Activity in well construction within the basin has been declining consistent with lakeshore utilities extending both sewer and water service to suburban neighbors and new development. Yet rural portions of Mount Pleasant, Caledonia, Yorkville, Somers, Raymond, Muskego and New Berlin continue to grow. On average, 214 wells per year have been drilled in the basin since 1990. Caledonia accounted for the most activity, with 45 new wells per year, compared to roughly 20 per year in other townships and only three to four per year in Oak Creek and eastern New Berlin, where city water typically served new development.

Drinking water systems serving more than 25 people per day are considered public. Over 260,000 people are served in their homes by 46 public systems in the basin (Table 7). Public systems are further divided by whether they serve residential customers in houses or apartments (community systems), or non-residential uses like businesses and schools (non-community). In the last two years 35 new community drinking water projects were approved in the Root-Pike River Basin, including municipal wells, pumps, water towers, pressure booster stations and chemical feeders. The community and non-community systems are further divided by other criteria defined in Table 7. We distinguish between all these water system types because drinking water quality regulations are based on the duration of contact the consumer has with the drinking water source.

Table 7. Drinking Water System Types

Type of water System	Example	Number in Basin	Residential Population Served
Private	Individual homes, small businesses	14,000	43,000
Public Community Systems	**Residential**		
■ Municipal	Water provided by a public utility (City or Village). Could be a well or surface water (Lake Michigan) source	15	256,000
■ Other than Municipal	Water provided through a subdivision or mobile home park well	31	5,000
Public Non-Community Systems	**Non-residential**		
■ Transient (serving different people daily)	Taverns, restaurants, campgrounds	162	
■ Non-transient (serving the same people daily)	Schools, factories, offices	44	

Public Drinking Water Surveillance and Monitoring

The quality of our drinking water is dependent on the quality of the surface or groundwater source. Compared to surface waters nationwide, Lake Michigan is an excellent, reliable source of drinking water that is low in solids and organic matter. Any surface water is not pristine however, and must be treated to remove microbial and chemical contaminants to prepare water for drinking. Regular testing ensures that water remains safe for drinking.

WDNR staff or delegated county staff survey public water systems every five years for compliance with sanitary regulations. Municipal systems are inspected annually. In addition to inspections, each public system in the Root-Pike River Basin must submit, on a regular schedule, water samples or test results, for a variety of potential contaminants to comply with the Federal Safe Drinking Water Act. Sampling frequency depends on the type of system, population served, and hazard of the contaminant. For example, bacteria testing at a large municipal system can occur several times daily, while at others only monthly or annually. Pesticide or radioactivity testing can occur quarterly to once every nine years.

Ninety-eight percent of all public drinking water systems in the Root-Pike River Basin continuously meet all water quality standards. Occasionally public systems exceed a standard for pollutants like bacteria, nitrates or volatile organic chlorides. This is quite rare within the basin. Temporary violations of the bacteria standard occurred in just two percent of the public drinking water systems in the basin over the last 10 years. Violations for inorganic and organic contaminants occurred in less than one tenth of one percent of the systems. The WDNR maintains a drinking water quality database for all public systems that is accessible to the public on the Internet. ***If you are interested in finding out about the quality of your drinking water, please visit the drinking water database at*** www.dnr.state.wi.us/org/water/dwg/dws.htm

Private Drinking Water and Groundwater

Potential sources of contamination affecting groundwater include unfiltered stormwater that runs into bedrock fractures, leachate from old dumps and landfills, fuel leaks at service stations, industrial spills, manure and salt storage areas, excessive application of fertilizer, inappropriate use of pesticides, septic systems, and even old, improperly abandoned wells.

Surface soils and geology play large roles in protecting groundwater from contamination. Because groundwater is generally more isolated from contaminant sources than surface water, groundwater requires little treatment. In fact, most private wells receive no treatment, while larger systems may only add chlorine or a corrosion inhibitor to keep water safe during distribution.

Proper well location, construction and maintenance is essential to delivering pure groundwater to consumers. The well drilling and pump installing industries are carefully regulated. WDNR staff conduct surveillance of well contractors and investigate well owner complaints. The water industry also conducts professional development and serves the real estate market conducting well inspections, testing and upgrading old systems. For individual homeowners and small businesses with private wells it's important to have the well tested and inspected to make sure it's not being affected by an unknown contaminant source. The WDNR Drinking and Groundwater Private Well Specialists provide technical assistance to citizens upon request for issues related to private wells, receiving about 400 technical assistance contact per year. Most of the contacts are related to groundwater aesthetics, mainly taste and odor problems, but more severe issues sometimes arise. ***For information about testing your private groundwater well in the Root-Pike River Basin, please contact the WDNR Private Well Specialist at (414) 229-0830.***

Each watershed within the Root-Pike Basin was ranked based on land coverage and groundwater sample analytical results in the WDNR's Groundwater Retrieval Network (GRN) database. The following table lists each watershed score and gives a short description of the land cover and groundwater sample analytical data that determined the score.

Table 8. Groundwater Potential Contamination Rankings for Watersheds in the Root-Pike River Basin.

Watershed Name	Score*	Comments
Pike Creek	72.17	Land cover in the watershed consists of 41% urban, 20% agriculture, 19% grassland and 9% forest. Once well exceeded the groundwater enforcement standard (ES**) for nitrate.
Pike River	12.52	Land cover in the watershed consists of 3% urban 9% agriculture, 7% grassland and 61% forest.
Root River	65.01	There is one CAFO*** in the watershed. Of 7 wells tested for nitrate, one (1) exceeded the groundwater preventive action limit (PAL**). Land cover in the watershed consists of 14% urban, 49% agriculture, 17% grassland and 11% forest.
Wind Point	63.84	Land cover in the watershed consists of 36% urban, 19% agriculture, 19% grassland and 14% forest.
Oak Creek	59.50	Land cover in the watershed consists of 38% urban, 11% agriculture, 32% grassland and 11% forest.

**Score based upon land coverage and groundwater sample analytical results for nitrate and pesticides in WDNR GRN database. Score of 30 or greater is considered high for groundwater contamination potential.*
***ES: Groundwater enforcement standard as per NR 140 WI Admin. Code. For nitrate the groundwater ES is 10 ppm.*
PAL: Groundwater Preventive Action Limit as per NR 140 WI Admin. Code. For nitrate the groundwater PAL is 2 ppm.
****CAFO: Confined animal feeding operations that consist of the equivalent of 1000 animal units.*

Chapter 3. Land Resources of the Root-Pike River Basin

The previous chapter discussed the different resources and issues related to surface and groundwater quality. It should be apparent from that discussion that land use plays an important role in water quality and habitat protection and degradation. This chapter will focus on the land resources within the Root-Pike River Basin.

WETLANDS

Wetlands are a critical link between our land and water resources. Until very recently, wetlands were considered a sort of wasted land, with little to no value unless altered by draining or filling. Wetlands are very important not just for the plants and animals they sustain, but for their benefits to humans.

Wetlands:

- help protect and enhance water quality by keeping pollutants from reaching lakes, rivers, streams and groundwater;
- help reduce flood damage by storing runoff from rains and snow melt;
- protect shorelines from erosion damage caused by waves and currents;
- provide for groundwater discharge and recharge in some areas;
- provide critical habitat for many wildlife species, fish and other aquatic life;
- enhance our quality of life, property values and tourism by providing beautiful open spaces that support many plant and animal species.

Wetlands Before Settlement

It is difficult to determine exactly how many acres of wetlands were in the Root-Pike River Basin prior to European settlement. The statewide estimate of wetland acreage at the time of the surveys was approximately five million acres. We now know these estimates were low by about 100 percent! There are many reasons for this discrepancy. The original surveyors of the state did not use similar interpretations of what were considered wetlands, nor were the survey methods used very accurate. Some surveys were done in winter when wetlands were covered under ice and snow. The surveys were conducted by walking the section lines of the Public Land Survey System (PLSS). As a result, wetlands surveyed along these lines were mapped more accurately than those in the interior. Soil scientists estimate that Wisconsin actually had twice the acreage of wetlands (10 million acres) than originally estimated in the surveys. This was done much more accurately by classifying wet soils (somewhat poorly, poorly and very poorly drained) as wetlands. In the Root-Pike River Basin, the original surveyors estimated wetlands covered over 12,000 acres or six percent of the land area (Figure 8). We know this estimate is not accurate, since many wetlands that we find in large masses today, and many found along river corridors, were not included in the original surveys.

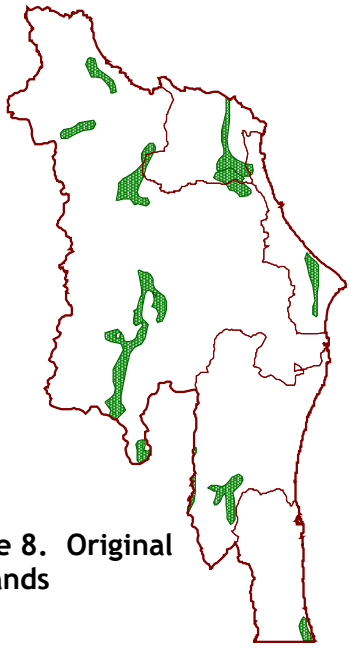


Figure 8. Original Wetlands

Wetlands Today

Today, using more modern techniques, we have a pretty good idea of the acreage of remaining wetlands in the Root-Pike River Basin. Data from the Wisconsin Wetland Inventory identifying the acreage of wetlands two acres in size and larger (and the locations of smaller wetlands) indicate that the Root-Pike River Basin currently contains more than 8800 acres of wetlands (Figure 9). Inventories maintained by the Southeastern Wisconsin Regional Planning Commission, which also document the areas of wetlands smaller than two acres in size, document about 9,700 acres of wetland in the Basin. The following sections describe the wetland types in the Root-Pike River Basin.

Wetlands of the Root-Pike River Basin

Wetlands are very important for humans and the environment. For this report we classified wetlands in the Root-Pike River Basin by general type: hardwood swamp/floodplain forest, shrub swamp, marsh, and wet meadow. This section will describe the plant and animal characteristics attributed to each category.

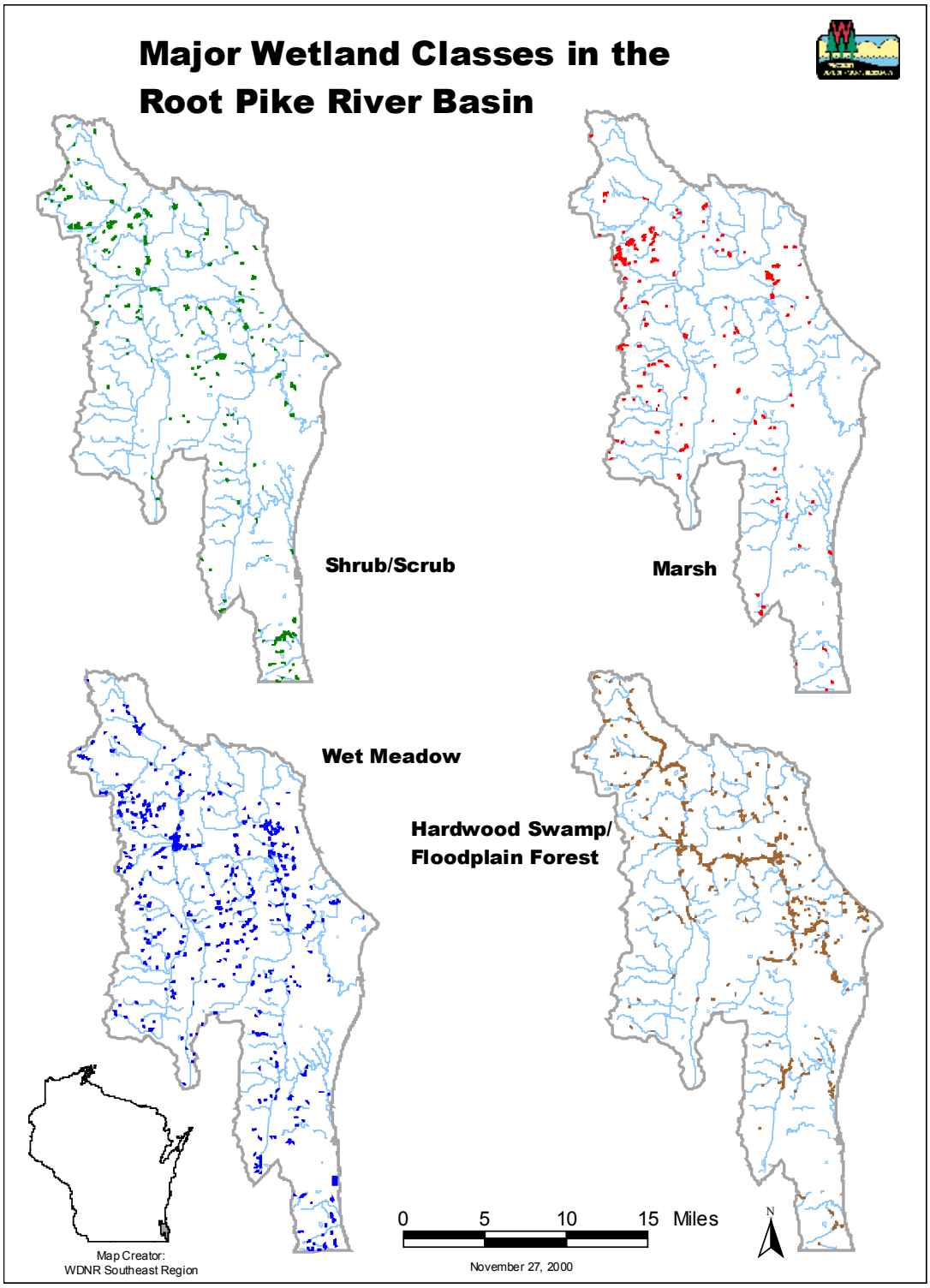
Hardwood Swamp/Floodplain Forest

Most of the wetlands closely associated with river corridors are of this type (Table 9). Floodplain forests generally occur in river valleys while hardwood swamps are commonly found on old lake basins or oxbows. Both wetland types are important for storing floodwaters. Hardwood swamps have standing water in spring and saturated soils or ponded water for much of the growing season. Floodplain forests are inundated during flood events and retain silt as the waters recede. Soils during most of the growing season are usually well drained. Trees found in hardwood swamps include black ash, red maple, silver maple, yellow birch and elm. These wetlands also have a shrub layer and ground cover similar to wet meadows with species including dogwoods, alder, skunk cabbage, marsh marigold, and sedges, ferns, grasses and forbs. Examples of these wetlands in the Root-Pike River Basin can be found along major rivers, such as the Root River Wet Mesic Woods, Caledonia Low Woods (Root River), Oak Creek Low Woods, and the Pike River Low Woods. Several isolated lowland woods are scattered throughout southern Milwaukee and eastern Racine counties, including Wood Creek Woods, Elm Road Woods and Wedge Woods.

Table 9. Root-Pike River Basin Wetland Vegetation Summary

Wetland Type	Acreage by Watershed/Percent of Watershed Land Area				
	Root River	Oak Creek	Wind Point	Pike River	Pike Creek
Hardwood Swamp/ Floodplain Forest	2311	156	139	224	82
Marsh	852	73	10	84	22
Shrub Swamp	1067	79	50	92	198
Wet Meadow	2026	170	46	284	906
Totals	**6267/4.9**	**478/2.9**	**245/2.0**	**684/1.9**	**1208/7.0**

Figure 9. Root-Pike River Basin Wetland Vegetation



Common trees in floodplain forests include silver maple, green ash, cottonwood, elm, black willow and box elder. Because of frequent flooding, these wetlands generally lack a shrub layer. Typical ground cover in floodplain forests is swamp buttercup, stinging nettle, cut-leaved coneflower, and jewelweed.

Both wetland types are important for supporting diverse communities of amphibians and reptiles. Temporary ponds are created during spring floods, providing important breeding grounds for amphibians. Amphibian and reptile species commonly found in these wetlands include American toads, eastern gray tree frogs, spring peepers, wood frogs, blue-spotted salamanders, central newt, redbacked salamanders, painted turtles, snapping turtles, eastern garter snakes, northern ringneck snakes, northern water snakes and red-bellied snakes.

Rare bird species such as the cerulean warbler, Acadian flycatcher, prothonotary warbler and red-shouldered hawk can be found in floodplain forests. Other bird species associated with both wetland types include belted kingfisher, green heron, spotted sandpiper, wood duck, mallard duck, flicker, pileated woodpecker, hooded mergansers and barred owls.

The stream and river corridors created by hardwood swamps and floodplain forests often provide valuable cover and transportation routes for white-tailed deer, muskrat, mink, raccoons, opossums and beaver.

Shrub swamp

Woody vegetation like the shrub willows, red osier and silky dogwoods are dominant in the 1486 acres of shrub swamps found in the basin. These wetlands occur on saturated or seasonally flooded muck soils and on the mineral soils of floodplains. Drainage, fire suppression and lowland forest cutting may cause wet meadows to become shrub swamps.

These wetlands provide habitat for grouse, songbirds and small mammals, and winter habitat for upland game such as pheasants, white-tailed deer and rabbits and turkeys. American toads, chorus frogs, leopard frogs and eastern tiger salamanders are also found in shrub swamps.

Marshes

Plants such as cattails, sedges, bulrush and arrowhead growing in permanent to seasonal shallow standing water characterize marshes. These wetlands store floodwater, protect shorelines from erosion and improve water quality by filtering out pollutants. The Caledonia Wildlife Refuge is an open wetland marsh with cattails, sedges, willow, bulrush, arrowhead, water plantain, *Elodea* and *Chara*. The marsh, owned by the Town of Caledonia, provides a critical migration stopover for waterfowl during the spring and fall migrations. Species that use this wetland include ducks, swans, geese, red-wing blackbird, coot, great blue heron, green backed heron, egret, muskrat, mink and a variety of frogs and turtles.

Wet Meadows

Wet meadows include sedge meadow, low prairie, fen and fresh (wet) meadow. This wetland type encompasses over 3400 acres of land within the basin, making this the most abundant wetland type in the Root-Pike Basin. Wet meadows, with their dense vegetation are often located between upland areas and waterways, thereby serving an important water quality function by keeping soils and associated nutrients from entering lakes and rivers. Typically, standing water is found in wet meadows only during the spring, and after periods of heavy rain.

The Monastery Lake Wetlands in the City of Franklin contain a diversity of wetlands including deep and shallow marsh, sedge meadow, fresh wet meadow, shrub-carr and the last tamarack remnant in Milwaukee county. The wetland is surrounded by highway on one side and open field on the other

sides, but development is slowly encroaching on the property. Wildlife using this wetland include muskrat, mink, various waterfowl, Canada geese, great blue heron, green-back heron, red-wing blackbird, common yellowthroat, chorus frog, green frog, spring peeper, American toad, painted turtle, snapping turtle and garter snake.

The Chiwaukee Prairie also contains a variety of wetlands including fresh (wet) meadow, shallow marsh and shrub carr. Please see the section on prairies (beginning on page 32) for more information.

Challenges to Wetlands

Lands that were perpetually or seasonally wet were historically considered less valuable unless filled for development or drained for agricultural purposes. As in other areas of southeastern Wisconsin much of the land in the Root-Pike Basin is urbanized or urbanizing, so many of the wetlands have been drained or filled. It wasn't until recently that federal and state decision makers recognized the need to provide some protection for wetlands.

The first attempt on a federal level to stem the loss of wetlands was Section 404 of the 1972 Clean Water Act. This section was enacted to regulate the discharge of dredge and fill material into surface waters and wetlands. These regulations, administered by the Army Corps of Engineers (ACOE) may have slowed the rate of wetland loss in the state, but it wasn't until 1991 when Wisconsin adopted state wetland water quality standards that the rate of wetland destruction was significantly decreased. Some wetland loss statistics compiled for time frames before and after statewide control of wetland loss are presented below. A recent U.S. Supreme Court decision may limit the ability of the Corps of Engineers and WDNR to regulate wetland modifications, putting over four million acres of Wisconsin wetlands in jeopardy. Officials from both agencies are working to fully understand the consequences of the court decision.
For more information about these developments, visit the WDNR web site at www.dnr.state.wi.us/org/water/fhp/wetlands.

Statewide Wetland Losses

The WDNR examined ACOE permit decisions from 1982 through August 1991 (the year statewide wetland water quality regulations were adopted). During this time period, WDNR estimated that nearly 13,000 wetland acres (1440 acres/year) statewide were filled legally. Note that this estimate does not include illegal wetland filling, wetland drainage, and it is likely that some ACOE wetland permit decisions were overlooked.

Following adoption of statewide wetland water quality standards in 1991 which enabled WDNR in many cases to restrict or modify ACOE permit decisions, permitted wetland losses decreased statewide by 460 percent for the time frame August 1991-April 1998. About 2,000 wetland acres (312 acres/year) were legally filled statewide. Again, these numbers are considered estimates that do not include illegal wetland filling, wetland drainage and pre-authorized or overlooked ACOE permit decisions.

Regional Wetland Losses

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) examined wetland loss statistics for the period 1970-1985 in their seven county planning area. During this time SEWRPC estimated regional wetland losses at just over 4,000 acres.

Wisconsin Department of Transportation (DOT) wetland loss records from 1990-1999 for the eight counties within the WDNR Southeast Region were examined. Approximately 170 acres of wetland were filled for DOT projects during this time frame.

Root-Pike River Basin Wetland Losses

A review of WDNR permits issued for wetland projects within the Root-Pike River Basin showed that about 24 acres were altered legally between 1991 and 1999. These numbers may not be a complete representation of the extent of wetlands affected in the basin because of jurisdictional restrictions, illegal wetland filling and other unauthorized activities.

Wetland Restoration and Protection

While some of the discussion presented above regarding wetland losses may sound rather grim, more opportunities than ever before are available for landowners to restore and protect wetlands. Following are brief descriptions of some wetland restoration and protection programs.

The Natural Resources Conservation Service (NRCS) offers landowners resources to restore and protect wetlands. The Wetland Reserve Program (WRP) allows landowners the opportunity to receive cost share payments for restoring wetlands on their property. The Conservation Reserve Program (CRP) allows the NRCS to enter into contracts with farmers to remove cropped wetlands and highly erodible cropland from production for 10-year periods. Because the landowners do not enter into perpetual easements, acreage figures of enrolled land will vary from year to year. ***For more information on the WRP and CRP programs, please visit the NRCS web site at*** **www.nrcs.usda.gov, *or call your county NRCS agent*.**

The Wisconsin Department of Transportation is required to compensate for unavoidable wetland loss from transportation projects through wetland mitigation. From 1991 through 1999 over 170 acres of wetland were lost to road projects in WDNR's eight county Southeast Region. To compensate for this loss, the DOT restored over 250 acres of wetlands in the region.

Even though the decline of wetlands has slowed as we realize their many benefits and implement protection programs, a comprehensive approach to wetland protection and restoration is needed. In a recent publication, *Reversing the Loss: A Strategy for Protecting & Restoring Wetlands in Wisconsin* (WDNR, 2000) the WDNR Wetland Team outlines a strategy for protecting Wisconsin's remaining wetlands over the long term. The overall strategy recommends that the WDNR:

- strengthen relationships with property owners, nonprofit conservation organizations and local governments ,
- manage wetlands to protect diversity of species, wildlife health and ecological integrity,
- streamline our regulatory approach for permits and restoration activities in wetlands, and
- develop and use modern technology to map, monitor, protect and manage wetlands.

The goals and actions identified in the strategy give WDNR and its many partners a solid foundation from which to work together to protect and restore wetlands throughout the Root-Pike River Basin and the state.
For more information on this strategy and what you can do to protect and restore wetlands, please visit the web at http://www.dnr.state.wi.us/org/water/fhp/wetlands/reversing.pdf.

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) recently published the findings of a technical advisory committee that identified high quality natural areas and critical species habitats in their seven county planning area (SEWRPC, 1997). The main purpose of this effort was to identify areas of significant resource value (natural areas), and provide recommendations for

protecting and managing these areas. Natural areas are defined by SEWRPC as "tracts of land or water which were so little modified by human activity, or which have sufficiently recovered from the effects of such activity, that they contain intact native plant and animal communities believed to be representative of the pre-European settlement landscape". Many of the areas identified in the report are wetland areas. Over 2,000 acres of wetland dominated lands in the basin were found to possess natural resource features of such quality to merit natural areas designation. These parcels were designated a classification of NA-1, NA-2 or NA-3.

NA-1 parcels are the highest quality areas statewide and are of great significance. They represent nearly complete and virtually undisturbed plant and animal communities resembling presettlement vegetation. NA-2 sites are classified as having countywide or regional significance. These areas have some apparent human disturbance, but generally have somewhat complete native biotic communities. Sites classified as NA-3 have obviously been altered by human activities, but still maintain good wildlife habitat and may contain stands of plants that no longer exist in adjacent areas. These sites are considered of local significance.

Three areas with major wetlands within the basin were identified with the highest quality classification of NA-1 (Table 10), while several other parcels were classified as NA-2 and NA-3. Some of these high quality areas are in public ownership, but most are privately owned.
For more detailed information on the natural areas within the SEWRPC planning area, please see SEWRPC Planning Report No. 42. "A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin."

Table 10. High Quality Wetland Areas in the Root-Pike River Basin. ***Source: SEWRPC, 1997).***

Area Name	Size (acres)	Description and Comments
Carol Beach Low Prairie and Panne State Natural Area	39	A rich low prairie and calcareous fen on dune-and-swale topography. Rare plants including the state endangered smooth phlox are present.
Chiwaukee Prairie State Natural Area	309	Extremely rich prairie and marsh on gentle swell-and-swale topography created when the level of glacial Lake Michigan was lowered in stages. The resulting different micro-environments help support over 400 plant species. This site is a National Natural Landmark.
Kenosha Sand Dunes and Low Prairie	99	One-half mile of Lake Michigan frontage containing well-developed dunes and dune succession patterns. This is one of the few dune systems in SE Wisconsin, with several rare plant species present including sea rocket, sand reed, seaside spurge, common bugseed, smooth phlox and marsh blazing star.

PRAIRIES AND OAK SAVANNA

Wisconsin was once covered with over two million acres of prairie and 5.5 million acres of oak savanna, a transitional community between prairie and forest. Today, less than one percent of the original prairies of Wisconsin remain. Tall grass prairies and oak savannas are the most decimated ecosystems today, with only 0.1 percent of the original acreage remaining. Over 1700 species of vascular plants native to Wisconsin and 28 percent of the endangered and threatened plant species are found in prairie and oak savanna ecosystems. Farming, grazing and fire-suppression were the major factors causing declines in prairies and savannas.

Root-Pike River Basin Prairie Communities

According to the original state surveys, the lands in the Root-Pike River Basin once contained over 63,000 acres of prairie (30 % of land area) and nearly 20,000 acres of oak savanna (9% of land area). Today only about 600 acres (1% of land area) of prairie and oak savanna habitat remain in the Root-Pike Basin. Low prairies and mesic prairies found in several parcels are the major prairie types found in the basin. One area containing oak savanna remains.

Low Prairie

Low, or lowland prairies, are found in river valleys or lake basins where the soil is nearly always wet from surface water in winter and spring, or from floodwaters at any time of year. Chiwaukee Prairie and the Carol Beach State Natural Area contain excellent examples of low prairie habitat.

Plants found in low prairies include blue-joint, cordgrass, big bluestem, upland wild timothy, sedges, Canada wild rye, marsh marigold, bottle gentian, blue flag, common milkweed, false toadflax, Canadian tick-trefoil, prairie phlox, black-eyed susan, meadow anemone, horsetail and purple meadow rue.

Wildlife found in low prairies include snipe, woodcock, red fox, coyote, barn swallow, grasshopper sparrow, savanna sparrow, eastern meadowlark, bobolink, Henslow's sparrow, upland sandpiper, field sparrow, eastern kingbird, goldfinch, red-wing blackbird, red-tail hawk, western fox snake, eastern hog-nose snake and Blanding's turtle.

Mesic Prairie

Mesic prairies have deep mineral soils ranging from dry-mesic (well drained) to wet-mesic (very poorly drained). This prairie type is found in areas with flat to gently rolling topography where there is an accumulation of well-developed soils. Because of their deep, fertile soils the once large expanses of mesic prairie were converted to agriculture. Today, the remaining mesic prairies are small, fragmented and scattered, often found along railroad rights-of-way. The Root River Parkway Prairie in Milwaukee County and the privately owned Franksville Railroad Prairie and Union Grove Railroad Prairie contain good examples of mesic prairie.

High plant species diversity and tall grasses and forbs mark mesic prairies. Plant species found in mesic prairies include big bluestem, little bluestem, needle grass, prairie drop-seed, rough blazing star, compass plant, prairie dock, prairie violet, white wild false indigo, pasture thistle, yellow coneflower, nodding wild onion, stout blue-eyed grass, marsh gay-feather and smooth phlox. Because many mesic prairie remnants are disturbed, invasive species like white campion, sweet clover, red clover, leafy spurge, wild parsnip, common dandelion, bluegrass, smooth brome, orchard grass and quack grass can take over. Wildlife found in mesic prairies include snipe, woodcock, red fox, coyote, barn swallow, grasshopper sparrow, savannah sparrow, eastern meadowlark, bobolink,

Henslow's sparrow, upland sandpiper, field sparrow, eastern kingbird, goldfinch, red-wing blackbird, red-tail hawk, western fox snake, eastern hog-nose snake and garter snake.

Oak Savanna

Savannas are best described as the mid-point in the continuum from prairies to forest. These communities have features of prairies, gradually grading into forest. Because oaks were the dominant trees in most savannas of the Midwest, the term oak savanna became widely used for this transition zone. Wisconsin once had over 5.5 million acres of savanna, which were characterized into four groups based on the composition of their dominant plants: Pine Barrens, oak barrens, oak openings and cedar glades. Oak openings were the most prevalent savanna type within the Root-Pike River Basin.

Oak openings once covered nearly 10 percent of the lands in the basin. Today most of these savannas are gone. Major influences since European settlement include clearing and plowing, overgrazing, or invading trees and shrubs due to lack of fire, lack of grazing or both. The WDNR Natural Heritage Inventory estimates that less than 500 acres of the original oak savanna remain statewide. The Franklin Oak Woods and Oak Savanna owned by Milwaukee County, is the only area in the basin with vegetation that retains some oak savanna characteristics. The 76 acre site is a former oak savanna, with only the northern portion resembling savanna (SEWRPC, 1997).

The major tree types found in oak savannas are bur oak, white oak and black oak. Major prairie plant species include big bluestem, prairie cordgrass, switch grass, Indian grass, Coreopsis, spiderwort, goldenrod, gentian, wood-betony, birdfoot violet, nodding wild onion, rough blazing star, lead plant and blue-eye grass. Wildlife that would use oak savannas are species common to oak forests and prairies, including red-headed woodpecker, eastern kingbird, savannah sparrow, grasshopper sparrow, song sparrow, bobolink, eastern meadowlark, goldfinch, oriole, brown-headed cowbird, pheasant, badger, red fox, coyote, thirteen-lined ground squirrel, western fox snake, eastern hog-nose snake and garter snake.

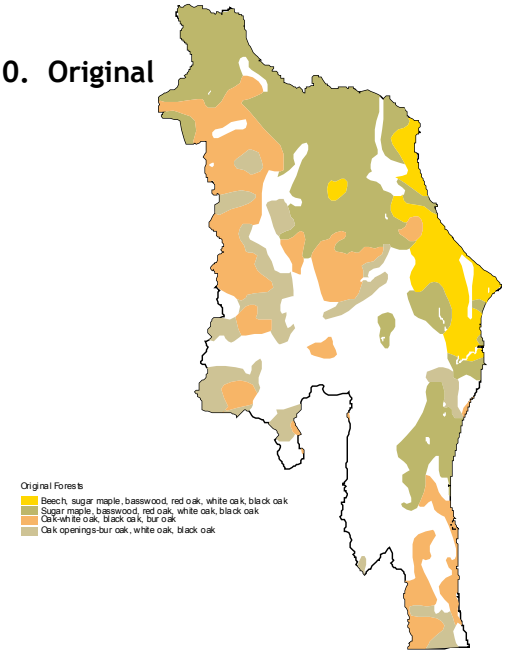
FORESTS

When discussing forests, some think of large unbroken expanses of land with many species of trees with a wide variety of plants and animals. Others may think of pines planted in neat rows, while others may consider the woodlot in their neighborhood a forest. Whether found in rural areas, suburbs or cities, forests in the Root-Pike River Basin come in all shapes and sizes.

Forests Before Settlement

The major forest types originally found in the Root-Pike River Basin are characterized as southern forests. This forest type is characterized by the absence of conifers, dominance of oak species, and presence of other tree species (shagbark hickory, black walnut, box elder) not normally found in the northern forests (WDNR, 1995). These deciduous forests once covered about 54 percent of the presettlement landscape of the basin (Figure 10). The forests supported many types of animals such as bison, elk, cougar, white-tailed deer, black bear, bobcat, mink, otter, beaver, muskrat and a rich diversity of birds. By the early 1920s, most of the forests in the basin were logged for lumber and other products and converted to agricultural land.

Figure 10. Original Forests



Forests Today

Today only about seven percent of the Root-Pike River Basin (14,000 acres) is considered forested. Forest types found in the basin include oak and central hardwoods, conifer plantations, and urban forests.

Oak and Central Hardwoods

The oak and central hardwoods forest type is the most common forest type in the basin. Red and white oak dominate these areas, with bur and black oaks often very abundant. Shagbark and bitternut hickory, black cherry and elm are interspersed with the oaks. Heavy pasturing took place in most woodlots until the 1950s or 1960s which allowed invasive common buckthorn and exotic honeysuckle to take over the understory. As the older oaks (120-140 years) die out, central hardwood species are slowly taking over. These central hardwoods, especially black cherry and shagbark hickories seem better able to regenerate and compete in the understory than oaks. The oak and central hardwoods forest is very productive for wildlife. White-tailed deer, wild turkeys, woodcock, rodents and songbirds use this forest type for food and shelter. Stands that are more open with dense underbrush provide habitat for birds like towhee, brown thrasher, blue jay and phoebe. Mature trees provide nesting cavities for woodpeckers, raccoon, squirrels and screech owls.

Conifer Plantations

Conifer plantations consisting of white pine, white spruce and Norway spruce provide cover and nesting habitat for a wide variety of wildlife. Properly managed (thinned) conifer stands can encourage an excellent understory of oak hickory, cherry, white pine and spruce. Wildlife found in conifer plantations include mourning doves, sharp-shinned and Cooper's hawks, red squirrels and cottontail rabbits. Conifer plantations are also important for forest interior birds, such as the hooded warbler. Wild turkeys, wintering birds and migratory songbirds use this type for cover during

inclement weather. Wild turkeys prefer white pine plantations near open water for winter roosting habitat, while white-tailed deer find cover during cold weather in dense conifer plantations.

Urban Forests

The urban forest is all of the trees and other vegetation in and around a city, village or development. Traditionally it has meant tree-lined streets, but it is important to remember that this forest is a complex network of green space extending beyond property lines and involving many different landowners. An urban forest also includes home and corporate landscapes, schoolyards, parks, cemeteries, vacant lots, riparian corridors, utility rights-or-way, adjacent woodlots and anywhere else trees can grow in and around a community. Shrubs, flowers, vines, ground covers, grass and a variety of wild plants and animals are also part of the urban forest. Streets, sidewalks, buildings, utilities, soil, topography and, most importantly, *people* are an integral part of the urban forest. The urban forest is, in fact, an *ecosystem*. To maintain the quality of the environment and the quality of life for the vast majority of Wisconsin residents, the urban forest must be managed.

Challenges to Forests

The basin forests prior to intensive development provided large tracts of habitat to support a wide variety of plant and animal species. The ecological makeup of these forests, along with natural occurrences (e.g. fires), provided the means to keep the forest communities diverse with a variety of tolerant and intolerant plant and animal species. The fragmented state of forests and woodlots today tend to favor adaptive animal species such as white-tailed deer, coyote, raccoon, skunk, blue jay, and cowbird. Many of the mammals that require large territories, once abundant in the forests, are now confined to northern areas or are absent from the state altogether. Forest plant species have also changed. Non-native species like garlic mustard and buckthorn are threatening to eliminate the native flowers and shrubs.

Major causes of habitat fragmentation are residential and road development. This not only creates habitat more favorable to species like white-tailed deer, but also limits the ability of wildlife managers to control high populations of these adaptable species.

Forest Management, Restoration and Protection

Many opportunities are available to private landowners, municipalities and non-profit organizations for managing, restoring and protecting Wisconsin's Forests. Below is just a sampling of some programs available, along with some specific objectives for forest management within the Root-Pike River Basin.

Wisconsin's Forest Tax Law

Forested lands are often taxed at a higher rate, which can create a financial burden on woodland owners. Some landowners over-harvest timber, or split their acreage into smaller and smaller parcels in order to meet their property tax payments. The purpose of Wisconsin's Forest Tax Law is to encourage proper forest management on private lands by providing property tax incentives to landowners. This is accomplished with a binding contract between the WDNR and private landowners. Management plans for lands enrolled in the program may include timber harvesting and thinning, tree planting, erosion control, and wildlife measures. ***For more detailed information, please see www.dnr.state.wi.us/org/land/forestry/ftax, or contact your local WDNR forester.***

Conservation Reserve Program

The Conservation Reserve Program (CRP) provides financial incentives to landowners to voluntarily establish and maintain vegetative cover on lands that need protection from erosion, to act as

windbreaks, or in places where vegetation can improve water quality or provide food and habitat for wildlife. This is a federally funded cost share program, administered by the Natural Resources Conservation Service (NRCS).

Wisconsin Forest Landowner Grant Program

The Wisconsin Forest Landowner Grant Program provides cost share assistance to landowners in managing their woodlots. Landowners must have an approved management plan before applying for funding. Practices often approved include tree planting, vegetative control, timber stand improvement, soil and water protection, wetland protection, restoration and enhancement, stream and stream bank protection, wildlife habitat creation or improvement and protection of rare natural communities and species.

Stewardship Program

Some of the most popular ways to protect high quality forest areas are through easement and acquisition. Wisconsin's Stewardship Program is a competitive program available to non-profit entities and local governments to acquire property for resource protection. *For more information on the Stewardship Program, please see:* www.dnr.state.wi.us/org/caer/cfa/LR/stewardship.

WDNR Urban Forestry Assistance

Sixteen communities and other unique participants within the Root-Pike River Basin are taking advantage of the WDNR Urban Forestry Program. Since 1993, 29 WDNR urban forestry grants totaling nearly $250,000 have been awarded to these communities. Cities, villages, towns, counties, tribal governments and nonprofit organizations are eligible to participate in this 50/50 matching grant program, which emphasizes developing or expanding management capacity for long-term urban forestry programs at the local level. Projects have included initiating volunteer tree boards, conducting tree inventories, developing management plans, organizing tree workshops, training for personnel and youth, and tree planting projects.

National Arbor Day Foundation Programs

The Tree City USA program, sponsored by the National Arbor Day Foundation is another important urban forestry program within the basin. This program recognizes towns, cities and villages across America that effectively manage their public tree resources. It also encourages them to implement a community tree management program based on four Tree City USA standards. These standards include developing a tree board or having a forestry department; developing a tree ordinance; budgeting at least two dollars per capita for a forestry program and celebrating Arbor Day and reading a proclamation. A community must meet each of these standards every year to qualify for the program. Nine communities in the basin participate in this program. The National Arbor Day Foundation also sponsors the Growth Award which recognizes communities that have gone above and beyond the four Tree City USA standards.

AGRICULTURAL LANDS

In many areas agriculture plays an important role in shaping the landscape of the Root-Pike River Basin. Lands in agriculture account for about 20 percent of the basin land cover. As urban development proceeds farmland is lost to development. The three counties within the basin (Kenosha, Milwaukee and Racine) have experienced double-digit percent decreases in the number of farms and corresponding significant decreases of acres in farming (Table 11).

Table 11. Number of Farms, Land in Farming and Farm Size for the Three Major Counties in the Root-Pike River Basin.

	KENOSHA			MILWAUKEE			RACINE		
	1987	1997	%	1987	1997	%	1987	1997	%
NO. of FARMS	505	388	-23	132	83	-37	710	554	-22
LAND IN FARMS (ACRES)	100678	84744	-16	8763*	6334	-38	133167	123012	-8
AVERAGE FARM SIZE (ACRES)	199	218	10	90*	76	-16	188	222	18

Farms don't only provide us with most of our dairy, meat, grain and vegetables, but also play an important role in water quality and wildlife management. You've already learned that soil erosion, poor manure management and livestock access have major effects on water quality in rural areas (see page 17). Many landowners are taking steps to decrease these effects while maintaining their ability to earn a living off their land.

Landowners in the Root River Watershed have participated in the Nonpoint Source Water Pollution Abatement, or Priority Watersheds Program. The program is a joint effort of the Department of Natural Resources (DNR), Department of Agriculture, Trade and Consumer Protection (DATCP), the University of Wisconsin Extension (UWEX), counties (usually through their Land Conservation Departments), municipalities, and lake districts with assistance from a variety of federal, state, and local agencies.

Through this program cost-share grant funding assistance is available to rural landowners at up to 70 percent to employ *best management practices* (BMPs) to control nonpoint sources of pollution to area waterways in high priority watersheds. Watershed or lake projects must be selected to receive cost-share assistance. Grant selection is highly competitive, occurring on a statewide basis. Since the beginning or the program within the Root-Pike River Basin, about 130 landowners have entered into voluntary cost-share agreements to control agricultural nonpoint pollution sources. Below are some accomplishments and considerations for the future.

Upland erosion and sediment transport from farm fields have been reduced by 50 percent on average throughout the basin. Watersheds with more cash crops continue to have higher erosion rates than those primarily in dairy. Agricultural market conditions have an effect on the erosion and sediment transport to surface waters. For instance, with a decline in dairy prices, many landowners convert fields that were once planted with hay and grains (low erosion rates) to a more profitable rotation of continuous corn and soybeans. Each spring and fall the fields that had been cash cropped have exposed soil that is more prone to erosion.

Phosphorus delivery from barnyards has been reduced by 30 percent. This is due to improved barnyard runoff management systems and declining animal based agriculture in the basin. Many of

the smaller livestock operations have gone out of business due to poor financial returns. Those that remain are better managed or are the larger total confinement operations with manure storage capabilities.

Critical acres spread with manure have been reduced by 30 percent. This pertains to winter manure spreading, and manure spreading on steeply sloped fields at any time, where the manure is more prone to running off into surface waters. More than 35 percent of the livestock operations in the basin continue to do some sort of "daily haul." Some of the largest livestock operations in the basin must winter spread at times due to undersized manure storage structures.

Direct access of animals to surface waters has been reduced. Fewer than 10 percent of livestock operations allow unlimited or uncontrolled access to streams and lakes. Many marginal wet pasture areas (wetlands) are commonly grazed throughout the basin, especially in mid summer to late fall.

Nonpoint Source Priorities in the Root Pike Basin

The Nonpoint Source Water Pollution Abatement Program is in the process of undergoing some changes. In 1997 the Wisconsin legislature called for the cooperating agencies in the Nonpoint Source Pollution Abatement Program to redesign the program. Part of this redesign directed the agencies to give counties the opportunity to develop their own Land and Water Resource Management Plans, which would provide a mechanism for the counties to implement nonpoint source conservation practices. The counties within the Root-Pike River Basin have developed their Land and Water Resource Management Plans to identify priorities for implementing nonpoint source pollution reduction and resource conservation efforts. These plans have received formal approvals from their respective County Boards and the state Land and Water Conservation Board. The goals and priorities of the county plans are reflected throughout this *State of the Root-Pike River Basin Report*. Water bodies or watersheds that are ranked high receive priority consideration for grant funding through the redesigned program. Ranks for the watersheds, streams, lakes and groundwater in the Root-Pike River Basin are listed below (Table 12). ***For more information on efforts to curb nonpoint source pollution, please see*** www.dnr.state.wi.us/org/water/wm/nps.

Table 12. Watershed Ranks for the Root-Pike Basin

Watershed Name	Overall Rank	Streams	Lakes	Groundwater
Pike Creek	High	High	Not Ranked	High
Pike River	High	High	Not Ranked	low
Root River	High	N/A	N/A	High
Wind Point	Not Ranked	Not Ranked	Not Ranked	High
Oak Creek	High	High	Not Ranked	High

For more information about watershed, stream, lake and groundwater rankings in your area, please see: www.dnr.state.wi.us/org/water/wm/nps/npsrank/lakeswatershedlist32801_gwa.pdf.

RECREATIONAL OPPORTUNITIES IN THE ROOT-PIKE RVER BASIN

Recreational opportunities abound in and around the Root-Pike River Basin and others parts of Southeastern Wisconsin. The only state-owned land within the basin is the Chiwaukee Prairie State Natural Area. This site is the richest known prairie remaining in Wisconsin, with five state-endangered and five state-threatened plant species. Hiking and nature study are the recreational opportunities at this 250 acre site. ***For more information on Chiwaukee Prairie, including access, please see the WDNR web site at*** www.dnr.state.wi.us/org/land/er/snas/snas54.htm.

Fishing is quite possibly the most popular recreational activity in the basin. The Root River boasts excellent seasonal Lake Michigan trout and salmon runs. The WDNR Lake Michigan Fishing Hotline ((414) 382-7920) keeps anglers up to date on trout and salmon fishing in the lake or tributaries.

If you're in the Racine area, make a stop at the Root River Steelhead Facility in the spring or fall to see impressive trout and salmon up close, or take a self-guided tour on the Internet at http://www.dnr.state.wi.us/org/water/fhp/fish/lakemich/rootriver.htm. The Root River facility is Wisconsin's primary source of steelhead eggs and brood (parent) stock. Each year, approximately 500,000 steelhead are stocked in Wisconsin waters of Lake Michigan.

County parks provide recreational opportunities in both rural and urban settings. These parks offer many outdoor opportunities for camping, golfing, hiking, fishing, team sports, and cross-country skiing, sledding, and picnicking. Many parks adjacent to lakes offer boat launches, swimming beaches and fishing opportunities. In addition, many larger county parks offer indoor activities within facilities such as aquatic centers, sports complexes and ice arenas.

Many park ponds throughout the basin are stocked with sport fish to provide fishing opportunities to individuals in urban areas. The WDNR also lends fishing equipment to groups or individuals interested in getting hooked on fishing. For more information, please call the WDNR Urban Fishing Coordinator at (414) 263-8679, or the Regional Fisheries Expert at (414) 263-8614.

For more information about what your county parks have to offer, please contact them directly using the information in Table 13.

Table 13. Contact Information For County Parks.

County Department	Phone Number/Internet Address
Kenosha County Parks Division	(262) 653-1869
Milwaukee County Department of Parks, Recreation and Culture	(414) 257-6100 www.co.milwaukee.wi.us/depart/d-parks.htm
Racine County Public Works Department	(262) 886-8440

The 2000+ miles of recreational trails within the Southeast Region provide for a myriad of opportunities. These trails owned by state, county, local governments and non-profit organizations meander through many state forests, parks, wildlife and natural areas to provide scenic wildlife viewing, biking, nature study and some horseback riding and hunting opportunities. In the winter months some of these trails also provide opportunities like cross-country skiing, snowshoeing, and snowmobiling.

The five-mile long Racine Multi-Purpose Pathway, currently under construction, will link downtown Racine with the Racine County trail, providing recreational access to the Root River for fishing, canoeing, and pleasure boating. Also nearby is the Ice Age Trail, easily accessible with a short drive. This trail is known for its distinctive glacial features and unique recreational opportunities. This National Scenic Trail meanders along the terminal moraine left by the Wisconsin glacier over 10,000 years ago. It begins at Potawatomi State Park on the shores of Lake Michigan and winds south through the Kettle Moraine State Forest. It turns north along the driftless area of the state and passes through the Chequamegon National Forest before ending at Interstate Park along the St. Croix River. ***For more information about the Ice Age Trail, please see the Ice Age Park and Trail Foundation web site at*** www.iceagetrail.org.

Chapter 4. Root-Pike Basin Partnership

THE IMPORTANCE OF PARTNERSHIPS

Recently the WDNR reorganized into twenty-three Geographic Management Units (GMUs) with a major focus on managing resources on a geographic basis, rather than by programs. The Root-Pike River Basin Land and Water Partners Team (Partners Team) was formed in 1998, and represents a wide range of federal, state, county and local agencies, nonprofit organizations and private sector interests. The Partner Team was formed to give citizens, environmental and conservation groups, businesses and local governments the ability to directly participate in setting priorities for work conducted throughout the Root-Pike River Basin. The use of such partner teams is an effective way to bring interested parties together within a defined geographic area to share resources while working toward common goals. It is not uncommon for public and private organizations to compete for limited funding to finance their projects. Working on projects together, rather than competing with each other to meet common goals is a major strength of a valuable partnership.

Root-Pike River Partnership Team, 1998-2000

From 1998 until the fall of 2000 the Root-Pike River Basin Land and Water Partners Team (Table 14) met as a full group nearly every other month. To guide the work and operations of the Partner Team, they first defined the group's purpose by development of a vision and mission statement. They then developed a set of issues affecting the natural resources and economic sustainability in the Root, Pike and Oak Creek watersheds.

> **Purpose:** The Root-Pike River Basin Partnership Team is a voluntary coalition of businesses, nonprofit groups, public agencies, educational institutions, organizations and individuals committed to restoring and sustaining the ecosystem of the Root-Pike River Basin while ensuring economic viability. Toward that end, the Partnership promotes comprehensive resource management, information exchange, and intergovernmental coordination and citizen involvement.
>
> **Vision:** Foster the Root, Pike, and adjacent Lake Michigan watersheds where the integrity of the land, water and air resources are protected and enhanced, and the economy of the region is sustainable and strong.
>
> **Mission:** To protect, restore, and sustain the ecosystem in the watersheds through the funding and facilitation of locally-initiated projects.

Table 14. Root-Pike River Basin Land and Water Partner Team: 1998-2000.

Name	Affiliation
Bob Biebel	Southeastern Wisconsin Regional Planning Commission
Dave Fowler	Milwaukee Metropolitan Sewerage District
Jerry Hebard	Natural Resources Conservation Service
Richard Jones	City of Racine
Jim McNelly	Wisconsin Department of Natural Resources
Michael Luba (co-chair)	Wisconsin Department of Natural Resources
George Melcher	Kenosha County Planning & Development
Jim Mueller	S.C. Johnson & Son, Inc.
Jeff Petro	Wisconsin Conservation Congress
Chuck Seeger	Racine County Land Conservation Department
John Shea	Citizen
Linda Sturnot	City of Franklin
Ron Thomas	Sustainable Racine
Allison Werner (co-chair)	River Bend Nature Center
Lori Artiomow	Kenosha/Racine Land Conservation Fund
Andy Yencha	University of Wisconsin-Extension

Through 2000 the Root-Pike Partnership Team worked towards defining the issues and needs facing the Root-Pike River Basins. These issues are listed in Table 15. One of the first issues identified by the Partnership Team was in the area of environmental education. The first major project that the Partner Team supported and participated in was the Root River 2000 Conference held at Festival Hall, Racine, WI.

The Root River 2000 Conference was a community project developed by the science teachers at Washington Park High School, Racine Unified School District. On April 19,2000 over 1500 students attended this unique interactive display focusing on the Root River watershed. Later that evening the general public was invited to attend and view over fifty exhibits and displays. By all accounts this conference was an overwhelming success and was the first major accomplishment of the partnership in meeting one of the key issues and needs identified by the partnership in the basin, education.

Table 15. Issues Identified by the Root-Pike River Basin Land and Water Partners Team.

1. Lands Protection/Preservation.

- Need for increased effort to protect environmental corridors and natural areas.
- Increase effort to promote brown-field redevelopment.
- Increased funding for protection of environmental corridor/natural areas in Southeastern Wisconsin.
- Loss of wetland habitat.
- Increased flooding caused by rapid urbanization and inadequate storm water management.
- Habitat fragmentation caused by single family homes
- Encourage municipalities in the basin to adopt *Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin* (SEWRPC, 1997).

2. Promote "smart growth" initiatives in the basin.

- Need for implementation of "Smart Growth" strategies to discourage urban sprawl.
- Need for land use management practices that promote clean water and healthy sustainable ecosystems.
- Encourage adoption of consistent and comprehensive stormwater management plans by all cities, villages, towns and counties in the basin.

3. Educate citizens about the importance of the basin as a resource and support efforts to improve, maintain and enhance its quality.

- Need for an educational strategy to increase awareness of natural resource issues in basins.
- Need for improving people's perception of the local rivers as major community assets.
- Need for increased use of GIS mapping in Southeastern Wisconsin.

4. Improve water quality by controlling both point and nonpoint sources of pollution.

- Lack of enforcement of erosion control ordinances.
- Ineffective erosion control and nutrient management on local croplands.
- Lack of household hazardous waste disposal site in Racine County.

5. Habitat Restoration.

- Damage caused by exotic plant and animal species.
- Insufficient resources to restore degraded natural areas.
- Loss of vegetated buffer strips along most waterways.
- Study impacts of Horlick Dam on the Root River

FORMATION OF THE ROOT-PIKE WATERSHED INITIATIVE NETWORK (WIN)

In early 2000, as the Partnership Team continued to develop it became increasingly apparent that the membership clearly wanted to develop in the direction of soliciting, critiquing and finally funding projects aimed at improving the Root and Pike River watersheds. In the June of 1999 and February of 2000 the Racine Community Foundation sponsored two key watershed meetings, which ultimately led to the formation of the Root-Pike WIN. The first meeting was a watershed stakeholders meeting held at the UW- Parkside. At that meeting, many different governmental agencies and non-profit organizations spoke about their efforts to improve the Root-Pike River Watershed. In February, 2000 Charley Curtis from the Saginaw Bay WIN was invited to a public forum to share his community's experiences with the Watershed Initiative Network approach. Subsequently, a grant from the Racine Community Foundation (RCF) was awarded to River Bend Nature Center in September 2000 which accelerated the local planning efforts for the formation of the Root-Pike WIN. Concurrently, the Root-Pike River Basin Land & Water Partnership voted unanimously to support the formation of the Root-Pike Watershed Network (WIN) and devote the efforts of the partnership team to its success.

In the fall of 2000 and the winter of 2001, the Root- Pike River Watershed Initiative Network (WIN) held its public meetings to discuss the formation of WIN. The original Root-Pike Partnership Team, Root River 2000, Friends of the Root River, River Bend Nature Center, Sustainable Racine, Wisconsin Department of Natural Resources, UW-Extension and the Kenosha/Racine Land Trust were many of the key organizations that participated in the formation of the Root-Pike Watershed Initiative (WIN). The Racine Community Foundation has continued on as a strong financial and leadership supporter of WIN. The S.C. Johnson Fund, Wisconsin Coastal Management Program, Racine's Make A Difference Day, C.S. Mott Foundation and many individual contributors have joined RCF in financially supporting WIN.

The Root-Pike WIN is a grassroots collaboration of a diverse group of volunteers who have solicited, critiqued and funded local projects by local people, projects aimed at improving the Root and Pike River watersheds. Grant applications are reviewed by WIN's volunteer Task Groups. The review process is designed to be interactive and supportive. Applicants work with Task Groups to develop their proposal to ensure a successful result. Grants are awarded twice per year, in April and November. Inquires and applications are accepted year-round.

WIN Vision

Foster the Root-Pike and adjacent Lake Michigan watersheds so that the integrity of the land, water, and air resources are protected and enhanced, while maintaining the strength and sustainability of the regional economy, and contributing to the health and social well being of all community members.

WIN Mission

To protect, restore, and sustain the ecosystem in the watersheds through the funding and facilitation of a regional network of locally-initiated projects.

Since the formation of the Root-Pike WIN, three grant funding cycles have been completed. Each funding cycle has seen an increase in the number, quality, and diversity of applications. Projects have ranged from educational programs to stream bank stabilization projects. Applications are accepted for projects that address one of Root-Pike WIN's the four priority areas: Agricultural and urban Pollution Prevention, Communication and Education, Land Use and Protection, and Water Resources. From April 2001-2002 seventeen projects have received Root-Pike WIN grants, totaling over $44,000 (see Tables 16-18 below).

Table 16. Root-Pike Watershed Initiative Network Grants, April 2001

Organization	Project Description	Amount
Citizens for Better Environment	Water Quality Education	$1000
St. Catherine's High School	Colonial Park Invasive Species Control	$500
UW-Extension	Watershed Conference	$1000

Table 17. Root-Pike Watershed Initiative Network Grants, November 2001

Organization	Project Description	Amount
Chiwaukee Prairie Preservation Fund	Land Management Equipment	$2,349
Lake Pointe Home Owners Association	Storm Water Detention Pond Improvement Project	$7461
Keep Our Beaches Open	Education Program	$1025
Kenosha/Racine Land Trust	Inventory of Mary Ellen Johnson Preserve	$1500
Lake Michigan Storm Sewer District	Study of Klema Ditch Flows	$2875
Prospect Hill Elementary School	Water Testing Program for Root River	$2026
Town of Mount Pleasant	Pike River Restoration Project Brochure	$4650

Table 18. Root-Pike Watershed Initiative Network Grants, April 2002

Organization	Project Description	Amount
City of Racine Health Dept.	Beach Sand *E-Coli* Study	$9236
Racine County Land Conservation	Bank Stabilization Project, Hoods Creek	$2000
Wisconsin Department of Natural Resources	Bank Stabilization Project Root River, Lincoln Park	$2000
Caledonia Conservancy	Educational Brochure for Trout Ponds Prairie	$1150
Town of Mount Pleasant	Aerial photo of Pike River Restoration Project	$3000
Olympia Brown School	Education Program on Native Landscaping	$500
Wisconsin Department of Natural Resources	Root River Assessment utilizing Rosgen Method	$2075

Root-Pike WIN plans to continue to work with the original Partner Team purpose of restoring and sustaining the ecosystem in the Root Pike Basin. They will accomplish this through continuation of the relationship with the Department of Natural Resources and other stakeholders in the watershed. Currently, Root-Pike WIN has 19 organizations represented by 30 participants (Table 19).

Table 19. Organizations Participating in Root-Pike Watershed Initiative (WIN), 2002

Caledonia Conservancy	City of Racine Health Department
Crispell-Synder Consulting	Hoy Audubon Society
Kenosha Unified School District	Milwaukee Metropolitan Sewerage District
Natural Resources Conservation Service	Racine Community Foundation
Racine County Land Conservation	Racine Zoo
SC Johnson Wax	Southeast Wisconsin Regional Planning Commission
Southeast Gateway Group, Sierra Club	Sustainable Racine
UW-Extension	UW-Parkside
Washington Park High School	Wisconsin Department of Natural Resources
YWCA River Bend Nature Center	St. Catherine's Environmental Club

Chapter 5. Root-Pike River Basin Priorities and Actions

Many of the land and water resources throughout the Root-Pike River Basin have been extensively modified or destroyed since the settlers first arrived in the 1600s. We now recognize the effects our actions have on the environment, and many groups and individuals are taking action. This chapter identifies the issues and actions that the Wisconsin Department of Natural Resources and partners have identified to monitor, manage, restore and protect the basin's resources. The actions identified below are grouped under broad subject headings and address both short- and long-term resource protection goals.

Strategic Planning

- In cooperation with the Root-Pike Watershed Initiative Network (WIN), convene a Strategic Watershed Planning Conference. The conference should include local representative stakeholders, local and state agencies and recognized experts in watershed planning.
- Develop a Strategic Plan for the Root-Pike Basin, drawing on input received during the Watershed Planning Conference. The plan should seek to integrate goals from the 2002 *State of the Root-Pike River Basin* Report, existing county Land and Water Resource Management Plans, Priority Watershed Reports, and MMSD Floodplain Management Studies.

Water Quality Monitoring and Management

- Conduct baseline monitoring surveys on at least 10 stream sites per year using standardized protocols for stream habitat, fish and macroinvertebrate community sampling.
- Assess sediment delivery, sediment transport, and streambank erosion within all watersheds of the basin.
- Document the links between land based activities and effects on water quality at each monitoring site.
- Provide data to central office modeling staff as determined by statewide priorities to develop total maximum daily loads and TMDL implementation plans for high priority water bodies on the 303(d) list.
- Identify areas within the Root-Pike River Basin with contaminated sediments and devise clean up strategies.
- Promote Mud Lake in the City of Franklin as a candidate for the Lakes Self-Help program.
- Conduct pre- and post- water quality monitoring and fisheries assessments at Conservation Reserve Enhancement Program (CREP) sites in cooperation with county Land Conservation Departments or equivalents.

Industrial and Municipal Point Sources of Pollution

- Identify the industrial and municipal wastewater treatment plants that are not in compliance with their discharge permits and take actions to bring these facilities into compliance.
- Continue to ensure that the permit backlog in the basin remains under 10 percent.
- Ensure that the municipal and industrial wastewater treatment plants required to remove phosphorus from their effluent remain in compliance with their discharge permit.
- Implement the recommendations outlined in the report *Sewer Overflows in Wisconsin-A Report to the Natural Resources Board* (WDNR, 2001) for sanitary sewer overflows. Specifically:
    - The WDNR must create and implement a statewide comprehensive system addressing sanitary sewer overflows (SSOs) that will ensure:
        a) Sewage collection systems are maintained, operated and managed to prevent the entry of groundwater infiltration and stormwater inflow to sewer systems to the extent practicable, and
        b) Infiltration and inflow that enters sewage collections systems does not cause or contribute to overflows.

- The WDNR must initiate an outreach program to ensure that all communities submit timely reports about SSOs from their sewer systems as required by their discharge permits, and become more aggressive in correcting the root causes of overflows, particularly excessive infiltration and inflow.

- Upon completion of the updated code for variance streams (NR 104), and promulgation of water quality standards for ammonia, phosphorus and thermal components in wastewater, reissue permits that implement the requirements of the rule changes.
- Continue to support the wastewater discharge database (SWAMP) to track compliance and accountability of dischargers.

Urban and Rural Nonpoint Sources of Pollution (including stormwater)

- Complete the municipal stormwater permitting process and ensure compliance for the eight municipalities identified in the Federal Phase I stormwater regulations.
- Issue permits for up to eight communities for the Federal Phase II stormwater regulations.
- Ensure that permitted construction sites are in compliance with their permit. Since problems are found at many inspected construction sites, take action to bring these sites into compliance.
- Issue permits for construction sites greater than one acre beginning March, 2003 to comply with the Federal Phase II stormwater regulations. This will increase the number of construction site permits ten-fold over the current numbers. Additional staff will be needed to keep up to date with this requirement.
- Encourage municipalities that are not under a municipal stormwater permit to apply practices outlined in the Draft Model Post-Construction Stormwater Zoning Ordinance.
- Identify non-complying industrial facilities in the scrap metal processing and auto dismantling industries and work to bring them into compliance with industrial stormwater regulations.
- In cooperation with the Natural Resources Conservation Service (NRCS) and the counties, promote and assist in the establishment of riparian buffers along all streams within the basin.
- Work in cooperation with communities to initiate Water Quality monitoring to assess effectiveness of storm water management techniques.
- Develop and promote I & E programs that address Urban and Rural Nonpoint sources of pollution.
- Encourage developers to employ conservation design principles in their site plans.

Habitat

- Encourage removal of dams and drop structures within the Basin.
- Conduct water quality and aquatic life surveys upstream and downstream of the Horlick Impoundment, Oak Creek Old Mill Dam, Petrifying Springs Golf Club Pond and Kenosha Country Club Golf Course Pond.
- As opportunities arise, assist in abandoning and removing dams and restore the in-stream and near shore areas.
- Identify urban and rural streams that have been modified and work with partners to develop priorities and funding mechanisms for implementing actions to restore degraded stream and corridor habitat.
- Establish buffers along all intermittent and perennial streams, wetlands, ponds and lakes through easements, land acquisition and voluntary landowner cooperation.
- Document the existing in-stream channel dimensions, erosion rates, sediment delivery and habitat of streams within the basin.

Wetlands

- Encourage reestablishment of historic wetlands, and the protection/rehabilitation of existing wetlands.

- Protect wetland complexes through acquisition, easement and other incentives in partnership with local communities, non-profit conservation organizations and other agencies.
- Implement the strategies outlined in *Reversing the Loss: A Strategy for Protecting & Restoring Wetlands in Wisconsin*.

Drinking Water and Groundwater

- Implement work plans and objectives for municipal facilities and other-than-municipal systems to maintain compliance with rules and regulations. This includes all other requirements that need to be implemented.
- Remain up-to-date on the latest technologies and regulatory rules and requirements. This is necessary because new technologies are being used to find and develop feasible solutions and alternatives to drinking water-related problems.
- Ensure all public water supplies are tested in accordance with the Federal Safe Drinking Water Act Regulations.
- The WDNR or its county delegate will conduct a sanitary survey at each of the 252 public water systems in the basin every five years.
- Conduct an inspection at each of the municipal waterworks each year.
- Contact each of the well drillers licensed in the basin each year at a job site to ensure proper well location and construction techniques are being employed to comply with regulations.
- Contact ten percent of the pump installers licensed in the basin each year, with half of the contacts made at a job site to ensure compliance with regulations.
- Complete a review and issue a decision for all complete public drinking water plans submitted within 90 days of receipt.
- The WDNR will make contact with at least one municipal building/plumbing inspection department per year within the basin to ensure that unused wells are being properly abandoned.
- Continue to provide technical assistance to private well owners to address questions and concerns related to groundwater and drinking water quality.
- Encourage development and implementation of well head protection ordinances to prevent encroachment on wells and their recharge areas.
- Kenosha and Racine Counties should continue to participate, or consider participating as delegates to locally enforce state rules regarding inspection and testing of private and non-community public wells.

Prairie Management and Restoration

- The WDNR will continue to work with the Natural Resources Conservation Service (NRCS) in the Farm Bill/Conservation Reserve Program to encourage landowners to convert highly erodible farmland into permanent cover for a minimum of 10 years. Changes have been made to the program to encourage landowners to use native warm season prairie grasses instead of the non-native cool season grasses previously used. WDNR staff provides technical assistance and offer to plant fields for a nominal rate. Conservation groups such as Wings Over Wisconsin, Pheasants Forever, The Wild Turkey Federation and local groups have provided funding to help defray the costs of seeds and for running equipment.
- WDNR staff will continue to burn several hundred acres of grasslands and prairies each season to restore and maintain native prairie species.
- Continue to acquire land within the Chiwaukee Prairie project boundary to meet the project goal of 400 acres.
- Protect, restore and manage state lands in the Chiwaukee Prairie Natural Area through controlled burns, brushing and invasive plant removal.
- Work to develop a storm water management plan for the immediate watershed draining to Chiwaukee Prairie.

- Develop a groundwater model for the Chiwaukee Prairie/Carol Beach area to aid the Village of Pleasant Prairie with future development issues and to help with determining the impact of new development on the prairie and Carol Beach residents.

Agricultural Lands

- Issue permits for livestock operations with over 1000 animal units and ensure water quality protection and compliance through annual permit review and annual report review.
- Work with expanding livestock operations to ensure compliance with water quality protection laws.
- Continue to respond to complaints alleging a discharge of animal waste to waters and issue Notice of Discharge where applicable.
- Bring farms in the basin into compliance with the Animal Waste Advisory Council prohibitions. Specifically ensure that:
- All livestock operations have no overflowing manure storage facilities;
- No unconfined manure stacks are located within Agricultural Water Quality Management Areas (300 feet from streams, 100 feet from lakes);
- Runoff from feedlots or stored manure will not enter water resources; and
- No animals can have unrestricted access to streams where degradation of the streambank has or will occur.
- Continue to encourage landowners to develop and implement nutrient management plans.
- Work with the County Land and Water conservation Districts to ensure individual landowners' compliance with operation and maintenance agreements for structural water quality practices cost-shared through the Priority Watersheds Program.
- Continue to work with county land conservation departments and rural landowners to encourage using conservation practices like minimum tillage, delayed mowing, rotational grazing and establishing buffers around wetlands and waterbodies to benefit wildlife and improve water quality.
- Annually assist municipalities and County Land and Water Conservation Departments in completing applications for Targeted Runoff Management (TRM) and Nonpoint Source Grants.
- Provide technical assistance and oversight for municipalities and County Land and Water Conservation Departments that have received TRM and Nonpoint Source grants.
- Implement best management practices to reduce the delivery of nutrients to surface waters from agricultural runoff.

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APPENDIX A. STREAMS OF THE ROOT-PIKE RIVER BASIN

How to Use the Stream Watershed Tables

The following information will help you interpret the specific information included in the stream tables for each watershed. *Note: A blank space anywhere in the table means that the data are unavailable or unassessed at the time of publication.*

Name of Stream: All named streams and some unnamed streams are listed. Stream names are those found on U.S. Geological Survey (USGS) quadrangle maps unless the Wisconsin Geographic Names Council established a different name. Unnamed streams are identified by location of the stream mouth as indicated by township, range, section and quarter-quarter section.

Length: Stream length is either the total length of the stream, or the starting and ending mile of the portion of the stream described. The stream mile at the stream mouth is zero ("0") and increases as one moves upstream.

Existing Use: This column indicates the existing biological use supported by the stream as defined in NR 102(04)(3) under fish and aquatic life uses. If the existing use is unknown, a blank space indicates the existing use is unassessed. The following abbreviations for stream uses are used in the tables:

> **COLD**; Cold Water Community; includes surface waters capable of supporting a community of cold water fish and other aquatic life or serving as a spawning area for cold water fish species.
>
> **WWSF;** Warm Water Sport Fish Communities; includes surface waters capable of supporting a community of warm water sport fish or serving as a spawning area for warm water sport fish.
>
> **WWFF**; Warm Water Forage Fish Communities; includes surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.
>
> **LFF;** Limited Forage Fishery (intermediate surface waters); includes surface waters of limited capacity because of low flow, naturally poor water quality or poor habitat. These surface waters are capable of supporting only a limited community of forage fish and aquatic life.
>
> **LAL;** Limited Aquatic Life (marginal surface waters); includes surface waters severely limited because of very low or intermittent flow and naturally poor water quality or poor habitat. These surface waters are capable of supporting only a limited community of aquatic life.
>
> **DEF**; Default; All streams not formally classified are assumed to meet the default federal Clean Water Act goals of supporting aquatic life and recreational uses. The DEF classification is the same as WWSF.

The table also includes the "class" of trout streams based on "Wisconsin Trout Streams" [DNR Publ. 6-3600(80)] and Outstanding/Exceptional Resource Waters, Wisconsin Administrative Code NR 102.10 and NR 102.11.

> **Class I** streams are high-quality streams where populations are sustained by natural reproduction.
> **Class II** streams have some natural reproduction but need stocking to maintain a desirable fishery.

Class III streams sustain no natural reproduction and require annual stocking of legal-size fish for sport fishing. The approximate length or portion of stream meeting each of the use classes is indicated.

Potential Use: This column indicates the biological use, and trout stream class a stream or stream segment could achieve if it was well managed and pollution sources were controlled. In many cases potential use is the same as the existing use classification. In other streams potential use may be higher than the existing use. Abbreviations are the same as those used in the existing use columns. The sources of information are indicated by footnotes on each table. The classification for trout streams came from "Wisconsin Trout Streams" [DNR Publ. 6-3600(80)], Wisconsin Administrative Code NR 102.10 and NR 102.11 and the professional judgments of area Fish Managers. If the potential biological use is unknown, a blank space indicates the potential biological use is unassessed.

Supporting Potential Use: This column indicates whether a stream is threatened (THR), or is fully (FULL), partially (PART), or not (NOT) meeting its potential biological use. An entry in any of the columns indicates the relationship between actual stream use and potential use. For example, if the entire length of a stream is listed under the "Fully" column, the stream has no problems which can be controlled. When a portion or all of a stream length is listed under another heading, the stream is affected or threatened by some manageable factor and the biological use of the stream can probably be improved. If use support is unknown, a blank space indicates it is unassessed.

Codified Use (water quality standard designation): This column indicates the formal stream classification of a particular stream. Streams considered to be formally classified are those listed in Adm. Codes NR 102 and NR 104, all those referenced in Wisconsin Trout Streams, NR 102 and other formal stream classifications which will be added to the codes upon the next revision. This column also indicates if the stream is classified as an outstanding resource water (ORW) or an exceptional resource water (ERW) in NR 102.10 and NR 102.11. All streams not formally classified assume the default federal clean water act classification of FAL (full fish and aquatic waters).

Streams classified as Outstanding Resource Waters (ORW) or Exceptional Resource Waters (ERW) in NR102.10 and NR 102.11 are:

Outstanding Resource Waters have the highest value as a resource, excellent water quality and high quality fisheries. They do not receive wastewater discharges and point source discharges will not be allowed in the future unless the quality of such a discharge meets or exceeds the quality in the receiving water. This classification includes national and state wild and scenic rivers and the highest quality Class I trout streams in the state.

Exceptional Resource Waters have excellent water quality and valued fisheries but already receive wastewater discharges or may receive future discharges necessary to correct environmental or public health problems. This classification includes about 1,400 trout stream segments not classified as Outstanding Resource Waters.

Assessment Category/Monitored or Evaluated: It is important to detail what information was used to derive a potential biological use designation and the degree to which a stream meets that potential use. If the potential use decision was based upon site-specific data, then "M," for monitored, is entered. If the decision is based on information other than site-specific data (citizen complaints, best professional judgment of a biologist or fish manager) then "E," for evaluated, is entered. "Evaluated" includes decisions based on data more than five years old.

Use Problems, Source/Impact: This column indicates the probable sources of pollution in the stream and the types of water quality problems present (impact). Some streams shown as fully meeting

potential use may still show up in this column as having a use problem. When this occurs it may mean there is a problem but it cannot be managed for some reason, or there is a potential threat to the use. These situations are explained in the narrative or in the references.

Following is a key to the abbreviations in the watershed tables:

Source (cause of problem):

- BDAM - Beaver dam
- CM - Cranberry marsh
- DCH - Ditched
- DRDG - Dredging
- GR.Pit - Gravel Pit Washing Operation
- HM - Hydrologic modification
- IRR - Irrigation
- LF – Landfill
- NMM - Non-metallic mining
- NPS - Unspecified nonpoint sources
- BY - Barnyard or exercise lot runoff
- CL - Cropland erosion
- CON - Construction site erosion
- PSB - Stream bank pasturing
- PWL - Woodlot pasturing
- RS - Roadside erosion
- SB - Stream bank erosion
- URB - Urban storm water runoff
- WD - Wind erosion
- PSM - Point source, municipal treatment plant discharge
- PSI - Point source, industrial discharge
- SS - Storm sewer

Impact (effect or impact of source on a stream)

- BAC - Bacteriological contamination
- CL - Chlorine toxicity
- DO - Dissolved oxygen
- FAD - Fish advisory
- FLOW - Stream flow fluctuations caused by unnatural conditions
- HAB - Habitat (lack of cover, sedimentation, scouring, etc.)
- HM - Heavy metal toxicity
- MAC- Undesirable rooted aquatic plant (macrophyte) or algae growth
- MIG - Fish migration interference
- NH3 - Ammonia toxicity
- NUT - Nutrient enrichment
- ORG - Organic chemical toxicity or bioaccumulation
- PCB - PCB bioaccumulation
- pH - pH (fluctuations or extreme high or low)
- PST - Pesticide/herbicide toxicity
- SC - Sediment contamination
- SED - Sedimentation
- TEMP - Temperature (fluctuations or extreme high or low)
- TOX - General toxicity problems
- TURB – Turbidity

References (Ref.) The numbers listed in this column are the references cited on the page below the table. Please refer to the references section for the full citation.

Data Level: This column indicates the level of data used to make decisions on the stream. The key below describes the meaning of column entries.

Bioassessments:

BI: Visual observations of biota, limited monitoring and extrapolations from other sites – unknown or low precision and sensitivity – professional biologist not required.

B2: One assemblage required with reference conditions of available, biotic index or narrative evaluation of historical records; limited to single sampling and site specific studies; low to moderate precision and sensitivity, professional biologist may provide oversight.

B3: Single assemblage, reference condition preferred; biotic index used or supplemented by historical records. Monitoring targeted sites during a single season; may be site specific study but may include spatial coverage for watershed level assessments. Moderate precision and sensitivity; professional biologist performs survey or training for sampling and assessment.

B4: generally two assemblages, may be one if data quality high. Regional reference conditions use; biotic index used. Monitoring over 1 –2 sampling seasons; broad coverage of sites for site specific or watershed specific assessments; use of probabilistic design. High precision and sensitivity; professional biologist surveys and assesses.

Habitat:

H1: Visual observation of habitat characteristics; no true assessment; documentation or readily discernible land use characteristics that might alter habitat quality, no reference conditions.

H2: Visual observation of habitat characteristics and simple assessment; use of land use maps for characterizing watershed condition; reference condition pre-established by professional scientist.

H3: Visual-based habitat assessment using SOPs; may be supplemented with quantitative measurements of selected parameters; conducted with bioassessment; data on land use compiled and used to supplement assessment; reference condition used as a basis for assessment.

Toxicological Approaches:

T1: Any one of the following: Acute or chronic WET, Acute ambient, or acute sediment

T2: Any of the following: Acute or chronic ambient, acute sediment, acute and chronic WET for effluent dominated stream

T3: chronic ambient or acute or chronic sediment, acute and chronic WET for effluent dominated stream

T4: Both of the following: acute and chronic ambient and acute or chronic sediment

Physical/Chemical

P1: any one of the following: water quality with grab sample or water data extrapolated from upstream or downstream, monitoring data more than five years old, BPJ based on land use data, etc.

P2: Any one of the following: water quality with grab sample or rotating basin surveys with multiple visits or automatic sampling synthesis of existing or historical information on fish contaminant levels, screening models based on loading data (not calibrated or verified)

P3: Any one of the following, composite or a series of grab water samples (diurnal coverage as appropriate), calibrated models

P4: All of the following: water quality monitoring used composite or series of grabs, limited sediment quality samples and fish tissue analyses at sites with high probability of contamination.

Table 20. Streams of the Pike Creek Watershed

Stream Name/Location at mouth	WBIC	Length	Biological Use		Codified Use	Supp.	Miles Assessed	Use Impairments		Data Level	Ref
			Ex.	Pot.				Source	Impact		
PIKE CREEK	1200	4.6	WWSF	WWSF	DEF	PART	E	HM, URB, NPS	HAB, MIG, TEMP, TURB	P1, H1	3
BARNES CREEK	700	2.5	WWFF	WWFF	DEF	PART	E	HM, NPS	HAB, MIG,	P1, B1, H2	1, 2
UN TRIB TO BARNES CREEK T1N R23E S18 SW SW		0.4	WWFF	WWFF	DEF	PART	E	HM, NPS	HAB, MIG	P1, H1	3
TOBIN CREEK	600	2.5	WWFF	WWFF	DEF	PART	E	HM, SB, NPS	FLOW, MIG, NUT, TURB	P1, B1, H2	1, 2
UN TRIB TO LAKE MICHIGAN T1N R23E S20 SW NE		0.3	WWFF	WWFF	DEF	PART	E	DREDGE, HM	HAB, MIG	P1, H1	3

References:

1. Randall, R. 1984. Formal Stream Classifications for Barnes Creek and Tobin Creek. Reports on File.
2. Wawrzyn, W. 1992. Formal Stream Classifications for Barnes Creek and Tobin Creek. Reports on File.
3. Helker, C. 2001. Best Professional Judgment of Water Quality Biologist.

Table 21. Streams of the Pike River Watershed

Stream Name/Location at mouth	WBIC	Length	Biological Use		Codified Use	Supp.	Assess. Category	Use Impairments		Data Level	Ref
			Ex.	Pot.				Source	Impact		
S BR PIKE RIVER (PIKES CREEK)	2500	5.0	WWSF	WWSF	LFF	PART	E	HM, SB, TURB	FLOW, HAB, MIG, TEMP	P1, B2, H2	1, 2,3
S BR PIKE RIVER (PIKES CREEK)	2500	1.0	WWFF	WWFF	LFF	PART	E	HM, SB, TURB	FLOW, HAB, MIG, TEMP	B2, H2	1, 2, 3
UN TRIB TO S BR PIKE RIVER T2N R22E S22 NW SW	2800	1.0	WWFF	WWFF	DEF	PART	E	HM, CL, SB	FLOW, HAB, TEMP	P1, H1	6
UN TRIB TO S BR PIKE RIVER T2N R22E S10 NE NE	2600	2.7	LFF	WWFF	DEF	NOT	E	HM, CL, SB	FLOW, HAB, TEMP	P1, H1	4, 6
SOMERS CREEK (TRIB TO S BR PIKE RIVER) T2N R22E S10 SE NW	2700	2.0	WWFF	WWFF	DEF	PART	E	HM, URB, CL	FLOW, HAB, MIG	P1, B2, H2	1
UN TRIB TO S BR PIKE RIVER T2N R22E S03 SE NW		1.8			DEF						
UN TRIB TO S BR PIKE RIVER T2N R22E S03 SW SE		0.4			DEF						
PIKE RIVER	1300	8.3	WWSF	WWSF	DEF	PART	M	SB, URB, HM, CL, CE, DEV	HAB, MIG, TURB, TEMP, FLOW	P1, H2, B2	2,3,5
UN TRIB TO PIKE RIVER (SORENSON CREEK) T2N R23E S06 SE SW	1400	4	WWFF	WWSF	DEF	PART	E	HM, CL, SB, URB, DEV, BY	FLOW, HAB	P1, H2, B2	1
UN TRIB TO N BR PIKE RIVER T3N R22E S35 SW NW	2100	3	LFF	WWFF	DEF	NOT	E	HM, SB, CL	FLOW, HAB, TEMP	P1, H1	4, 6
UN TRIB TO N BR PIKE RIVER T3N R22E S27 SE SE	2200	2.4	LFF	WWFF	DEF	NOT	E	HM, SB, CL	FLOW, HAB, MIG	P1, H2	6
UN TRIB TO S BR PIKE RIVER (AIRPORT TRIB) T2N R22E S33 NE SE	2825	1.0	WWFF	WWFF	DEF	PART	E	HM, SB	HAB, TEMP	P1, B2, H2	1
N BR PIKE RIVER	1900	7.0	WWSF	WWSF	DEF	PART	M	PSI, HM, SB, CL, RS, URB, DEV	FLOW, HAB, TOX, MAC, TURB, TEMP, DO	P1, B2, H2	1,2,3,5
UN TRIB TO N BR PIKE RIVER (BARTLETT BRANCH) T3N R22E S11 SW NW	2450	0.5	LFF	WWFF	DEF	NOT	E	HM, SB, CL	DO, FLOW, HAB, MAC, TEMP	P1, B2, H2	1
WAXDALE CREEK (TRIB TO N BR PIKE RIVER) T3N R22E S22 SE SE	2300	1.5	LFF	WWFF	DEF	NOT	E	LF, HM, DEV, PSI	TOX, HAB	P1, B2, H2	1

Stream Name/Location at mouth	WBIC	Length	Biological Use		Codified Use	Supp.	Assess. Category	Use Impairments		Data Level	Ref
			Ex.	Pot.				Source	Impact		
UN TRIB TO PIKE RIVER (KENOSHA BRANCH) T2N R23E S18 NE SW	1350	0.9	WWFF	WWSF	DEF	NOT	E	HM, CL, URB, DEV	FLOW, HAB	P1, B2, H2	1

References:

1. Burzynski, T. 1983. Stream Classification on File.
2. Mace, S. 1992. Stream Classification on File.
3. Kanehl & Lyons, 1990.
4. Fago, D. Multiple years. Fish assemblage information.
5. Roblek, K. 1999. Baseline Monitoring Data on File.
6. Helker, C. 2001. Best Professional Judgment of Water Quality Biologist.

Table 22. Streams of the Root River Watershed

Stream Name/Location at mouth	WBIC	Length	Biological Use		Codified Use	Supp.	Assess. Category	Use Impairments		Data Level	Ref
			Ex.	Pot.				Source	Impact		
ROOT RIVER	2900	42.6	WWSF	WWSF	DEF	PART	E	HM, NPS, SB, CE, RS, URB, DEV, PSM, PSI	FLOW, HAB, MIG, TURB	B2, H2, T1, P1	1, 7, 8
HOODS CREEK	3100	9.3	WWFF	WWSF	LFF	NOT	M	HM, NPS, CL, SB, DEV	FLOW, HAB, MIG	H2, B2, P1	2,3
UN. TRIB TO HOODS CREEK (IVES GROVE DITCH) T3N, R22E, S9, SW, NW	3300	1.2	LFF	LFF	LAL	PART	M	HM, CL, SB, RS, URB, DEV	FLOW, HAB, PST, MIG	H2, B2	2
UN. TRIB TO ROOT RIVER T5N, R22E, S34, SW, SE		2.7			DEF						
UN. TRIB TO ROOT RIVER T4N R22E S03 NW NW	3385	2.5			DEF						
HUSHER CREEK T4N R22E, S5, NE, SW	3500	5.2	WWFF	WWFF	DEF	PART	E	HM, NPS, CL, SB, DEV	FLOW, HAB	B2, H2	1,3
UN TRIB TO ROOT RIVER T4N, R21E, S01, NW, SE	3600	1.0			DEF						1
ROOT RIVER CANAL	4300	5.5	WWSF	WWSF	DEF	PART	E	DRDG, HM, SB, CL	DO, HAB, NUT	H1, P1	1, 8
E. BR. ROOT RIVER CANAL	4900	4.4	WWFF	WWFF	LFF	PART	M	HM, CL	FLOW, HAB, NUT, MAC	H3, P2	4, 8, 9
E. BR. ROOT RIVER CANAL	4900	6.5	LFF	WWFF	LAL	NOT	M	HM, CL	DO, FLOW, HAB, NUT, MAC	H3, P2	4, 8, 9
W. BR. ROOT RIVER CANAL	4500	10.7	WWSF	WWSF	LFF & LAL	PART	M	HM, CL, SB, CE, URB, PSM	FLOW, HAB, TURB	H3, B4	2,3
UN TRIB TO W. BR. ROOT RIVER CANAL T3N R21E, S10, NW, SW	4800	4.0			DEF						1
RYAN CREEK	5100	6.0	WWFF	WWFF	DEF	PART	M	HM, DEV	NUT, HAB	B3, H3	1, 3, 9
UN TRIB TO ROOT RIVER T5N R21E S15 SE, NE	5300	4.0	WWFF	WWFF	LAL	PART	E	PSM, DEV, HM	NUT, HAB, TURB	B1, H2	7, 10
DALE CREEK	6000	1.4			DEF						1
UN TRIB TO ROOT RIVER (TESS CORNERS CREEK) T5N, R21E, S4, NW, NE	6200	4.0	WWFF	WWFF	LFF	PART	E	URB, DEV, NPS, MIG`	TEMP, NUT	B3, H3, P1	5, 10
UN TRIB TO ROOT RIVER (HALES CORNERS CREEK) T5N, R21E, S4, NW, NW	6300	2.0	LFF	WWFF	LAL & LFF	NOT	E	URB, DEV, NPS	TEMP, NUT, FLOW, HAB	H1, B1	5

Stream Name/Location at mouth	WBIC	Length	Biological Use		Codified Use	Supp.	Assess. Category	Use Impairments		Data Level	Ref
			Ex.	Pot.				Source	Impact		
UN TRIB TO W. BR. ROOT RIVER CANAL(YORKVILLE CREEK) T3N R21E S03 SW SW	4700	2.0	WWFF	WWFF	DEF	PART	E, M	HM CL, SB, BY	FLOW, HAB	B3, H3	2,6
UN TRIB TO W. BR. ROOT RIVER CANAL (RAYMOND CREEK) T4N, R21E, S26, NW, SE	4600	2.0	LFF	WWFF	DEF	NOT	E	HM, CL, SB	FLOW, HAB, NUT, DO	H1, B1, P1	1, 10

References

1. Fago, D. Multiple years. Fish assemblage information.
2. Galarneau. S., 1992. Stream Classification on File.
3. Roblek, K. 1999. Baseline Monitoring Data on File.
4. Schultz and Johnson, 1975. Internal Memorandum on File.
5. Kurz, 1981. Stream Classification on File.
6. Wawrzyn, W. 1985. Stream Classification on File.
7. Data in Files, unknown author/date.
8. Wawrzyn, W. 1996. Watershed Assessment.
9. Helker, C. 2001. Baseline Monitoring Data on File.
10. Helker, C. 2001. Best Professional Judgment of Water Quality Biologist.

Table 23. Streams of the Wind Point Watershed

Stream Name/Location at mouth	WBIC	Length	Biological Use		Codified Use	Supp.	Assess. Category	Use Impairments		Data Level	Ref
			Ex.	Pot.				Source	Impact		
UN TRIB TO LAKE MICHIGAN T4N R23E S22 NW SW	7700	1.5			DEF						
UN TRIB TO LAKE MICHIGAN T4N R23E S17 NE SE	7800	2.9	WWFF	WWFF	DEF	PART	E	NPS, URB	FLOW, HAB	P1, H1	1

References:

1. Galarneau, S. 1995. Internal Memorandum on File.

Table 24. Streams of the Oak Creek Watershed

Stream Name/Location at mouth	WBIC	Length	Biological Use		Codified Use	Supp.	Assess. Category	Use Impairments		Data Level	Ref
			Ex	Pot.				Source	Impact		
OAK CREEK	14500	11.7	WWSF	WWSF	DEF	PART	E	HM, LF, SB, CE, URB	DO, FLOW, MIG, TURB, HAB, TOX	P1, H3, B3	1, 2
UN TRIB TO OAK CREEK (MITCHELL FIELD DRAINAGE DITCH) T5N R22E S10 SW NW	14800	3.4	LFF	LFF	LFF	PART	E	HM, LF, SB, PSM	DO, FLOW, TURB, HAB, TOX	P1, H3, B3	1, 2
UN TRIB TO OAK CREEK (NORTH BRANCH OAK CREEK) T5N R22E S20 SW SE	14900	6.1	WWFF	WWSF	DEF	PART	E	HM,, SB, CE, URB	DO, FLOW, TURB, HAB	P1, H3, B3	1, 2

References:

1. Wawrzyn, 1985. Water Quality Stream Appraisals for the Oak Creek Watershed. Internal Files.
2. Fago, D. Multiple years. Fish assemblage information.
3. Helker, C. 2001. Baseline Monitoring Data on File.

APPENDIX B. LAKES OF THE ROOT-PIKE RIVER BASIN

How to Use the Lakes Tables

The following explains the information used in the following lakes table. *Note: A blank space anywhere in the table means that data is unassessed or unavailable.*

LAKE NAME: All named and unnamed lakes are listed. Lake names are those found on U.S. Geological Survey quadrangle maps unless the Wisconsin Geographic Names Council has established a different name. Some lakes are known locally by other names; where available, local names have been listed with the official name.

WBIC: Water body identification code used by WDNR.

COUNTY (CO): Indicates the county in which the lake is located.

TOWNSHIP, RANGE, SECTION: township, range, and section identify lake locations.

SURFACE AREA: The surface area is the size of the lake, in acres, as listed on the WDNR Master Waterbody File, *Wisconsin Lakes* PUB-FM-900 (1995), Surface Water Resources of Dane County (WDNR, 1985), and *A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report* (SEWRPC, 1995).

MAX/MEAN DEPTH: Maximum depths are those listed in *Wisconsin Lakes*, WDNR PUBL-FM-800-95REV and *A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report* (SEWRPC, 1995).

LAKE TYPE: Each lake type displays unique limnological characteristics based on physical and chemical properties. Production of plant and animal life generally varies in accordance with lake type. Basic classifications and qualifying criteria are:

Drainage lake (DG): Impoundments and natural lakes with the main water source from stream drainage. Has at least one inlet and one outlet.

Drained lake (DR): Natural lake with the main water source dependent on the groundwater table and seepage from adjoining wetlands. Seldom has an inlet but will have an outlet of very little flow similar to the seepage lake except for the outlet.

Seepage lake (SE): Landlocked. Water level maintained by groundwater table and basin seal. Intermittent outlet may be present.

Spring lake (SP): Seldom has an inlet, but always has an outlet of substantial flow. Water supply dependent upon groundwater rather than surface drainage.

WINTERKILL: Winterkill (winter oxygen depletion) is a common problem in many shallow Wisconsin lakes. A kill can occur when at least four inches of snow cover the lake, which prevents sunlight from reaching the water. All photosynthesis stops and plants begin to die and decompose. The extent of oxygen loss depends on the total amount of plant, algae and animal matter that decays. Drought increases the chance of winterkill by reducing the volume of water in the lake. Y indicates the lake has experienced winterkill at least once. If blank, winterkill is not known to have occurred.

ACCESS:
BR = Boat Ramp
BF = Barrier-free boat ramp (boating dock and/or wheelchair access)
P = Barrier-free pier (wheelchair access)

T = Walk-in trail
R = Roadside
W = Wilderness
BW = Barrier-free wilderness access (wheelchair access)
NW = Navigable water access to lake
X = Some type of access available, but not specified

SH (Self Help Monitoring) This column identifies existing or recommended Self-Help monitoring. The following letters in each column signify that Self-Help monitoring is:
R = recommended
X = completed
C = currently being done

HG (Mercury) Numerous lakes in Wisconsin contain fish with elevated levels of mercury. Fish consumption advisories are issued semi-annually for lakes with fish mercury levels of 0.5 parts per million (ppm) or greater. Generally, predator fish from soft water, poorly buffered, low pH lakes have the highest concentrations of mercury. The most updated listing of waterbodies with fish consumption advisories can be obtained by writing to: Fish Advisory, Wisconsin Department of Natural Resources, P.O. Box 7921, Madison, WI 53707.

Groups:
R Fish mercury monitoring is recommended.
X Multiple fish populations have been tested for mercury content and a fish consumption advisory DOES NOT exist
XX Multiple fish populations have been tested for mercury content and a fish consumption advisory DOES EXIST due to mercury contamination.

MAC (Macrophytes): This column identifies the status of macrophytes or aquatic plants in the lake. Specifically, it indicates if the lake experiences Eurasian water milfoil and/or purple loosestrife, two invasive non-native species of plants that can impair the lake's aesthetic, ecological, and recreational values.

EM = indicates that Eurasian water milfoil is present in the lake and may be a problem
EM-W = lake part of research project to study the effectiveness of Eurasian water milfoil weevil in reducing and/or eradicating this plant from the lake.
PL = indicates that purple loosestrife is present in the lake and may be a problem

LMO (LAKE MANAGEMENT ORGANIZATION): Indicates whether or not a lake management organization (LMO) exists for the lake. An LMO can range from a small, loosely organized group of lake property owners to an association to a district, complete with by-laws and taxing authority. In the lakes table, the following letters are used to indicate whether the LMO is an association or district. If the type of organization is not known, but one does exist, a Y is used.

Y Indicates that a LMO does exist
ASSC Indicates that a lake management association exists
DIST Indicates that a lake management district exists
R Recommends that a LMO be developed; this recommendation is usually accompanied by a narrative recommendation in the watershed analysis section.

PHOSPHORUS SENSITIVITY (P SENS): This analysis classifies lakes according to their relative sensitivity to phosphorus loading and existing trophic condition. The screening identifies high quality lakes that should receive highest priority for nutrient control management. The analysis first separates lakes into two major categories: lakes that are sensitive to increased phosphorus loading (Class I) and lakes less responsive to changes in phosphorus loading (Class I). Lakes in each general

classification are then subdivided into management groups based on data needs or existing water quality conditions.

Class I (I):
A = existing water quality fair to excellent; potentially most sensitive to increased phosphorus loading.
B = existing water quality poor to very poor; less sensitive to increased phosphorus loading than group A.
Ins = data are inadequate or insufficient to assess trophic condition; classification monitoring recommended.
Class II (II):
A = existing water quality fair to excellent; may not be as sensitive to phosphorus loading as Class I lakes.
B = existing water quality poor to very poor; low sensitivity to increased phosphorus loading.
Ins = data inadequate or insufficient to establish appropriate management recommendations and priorities.

TROPHIC STATUS INDEX (TSI) CLASS: Lakes can be divided into three categories based on trophic state: oligotrophic, mesotrophic and eutrophic. These categories are general indicators of lake productivity.
Oligotrophic (OL) lakes are generally clear, cold and free of many rooted aquatic plants or large blooms of algae. Because they are low in nutrients, oligotrophic lakes generally do not support large fish populations. However, they often have an efficient food chain with a very desirable fishery of large predator fish.
Mesotrophic (ME) lakes are in an intermediate stage between oligotrophic and eutrophic. The bottoms of these lakes are often devoid of oxygen in late summer months, limiting cold water fish and resulting in phosphorus cycling from sediments.
Eutrophic EU) lakes are high in nutrients. They are likely to have excessive aquatic vegetation or experience algae blooms, sometimes both. They often support large fish populations, but are also susceptible to oxygen depletion. Small, shallow lakes are especially vulnerable to winterkill, which can reduce the number and types of fish. Lakes with a TSI less than or equal to 39 are generally considered oligotrophic, those with a TSI of 40-49 are considered mesotrophic, and those with a TSI equal to or greater than 50 are generally considered eutrophic.

All lakes naturally age, or progress from being oligotrophic to eutrophic. In many places, people have accelerated this process by allowing nutrients from agriculture, lawn fertilizers, streets, septic systems, and urban storm drainage to enter lakes.

COMMENTS: Additional information that was available for the lakes has been included in the comments column. Abbreviations were used to conserve space as follows:

Source - sources are the facilities or activities that contribute pollutants or stressors, resulting in impairment of designated uses in a waterbody.

AGSPR - Agricultural land spreading site
HM - Hydrological modification (dam, ditching, wetland drainage)
NPS - Unspecified nonpoint sources
CL - Cropland erosion
SB - Streambank erosion
PSB - Streambank pasturing
PWL - Woodlot pasturing
BY - Barnyard or exercise lot runoff (animal operations)
CE - Building construction site erosion

RS - Roadside construction erosion
SEP - Septic systems are or may be causing water quality problems
URB - Urban storm water runoff
DEV - Intense development pressure
WLF - Water level fluctuations

Causes/Stressors - causes are those pollutants or other conditions that contribute to the impairment of designated uses in a lake. Stressors are factors or conditions - other than specific pollutants - that cause impairment of designated uses in a lake.
HAB - Habitat
MAC - Undesirable macrophyte
ALG - Undesirable algae growth
NUT - Nutrient enrichment
SED - Sedimentation
TOX - General toxicity problems
TURB - Turbidity
DO - low dissolved oxygen
ACC - Access problems relate to the general public's inability to access the lake, which as a navigable waterbody is considered a water of the state.

Table 25. Lakes of the Root-Pike River Basin.

Lake Name	WBIC	County	Location T/R/S	Area (Acres)	Max. Depth (ft)	Type	Winter kill	Access	Self Help	Macro	Hg	LMO	P. Sen.	TSI Class	Comments
PETRIFIED SPRINGS PARK POND	1800	Racine	02 22E 11	10	5	DG	*	T			GA		II. INS	EU	
OAK CREEK PARKWAY POND	14700	Milwaukee	05 22E 11	5	8	DG	*	**			GA		II. B.	EU	HM, URB, NPS/TOX, TURB, SED
BOERNER BOT. GARDEN POND #1	6500	Milwaukee	06 21E 32	2	3	DG	*	**			GA		II. INS	EU	
BOERNER BOT. GARDEN POND #2	6700	Milwaukee	06 21E 32	1	4	DG	*	**			GA		II. INS	EU	
BOERNER BOT. GARDEN POND #3	6900	Milwaukee	06 21E 32	8	5	DG	*	**			GA		II. INS	EU	
DUMKES LAKE	5200	Milwaukee	05 21E 19	7	11	SE	*				GA				
KOEPMIER LAKE	5900	Milwaukee	05 02E 03	8	35	SE					GA				
MONASTERY LAKE	7500	Milwaukee	05 21E 08	12	30	SE					GA				
MUD LAKE	5500	Milwaukee	05 21E 01	5	21	SE		**	R		GA		I. INS	EU	
ROOT RIVER PARKWAY POND	5700	Milwaukee	05 21E 03	8	17	SE		**			GA		II. INS	EU	HM, URB, NPS/TURB, SED
SCOUT LAKE	6100	Milwaukee	05 18E 35	8	19	SE		**	C	E	GA		II. A	EU	NPS/SED
UPPER KELLY LAKE	7100	Milwaukee	06 21E 31	12	9	SP	*	BR	C	E	GA	ASSC	II. INS	EU	
LOWER KELLY LAKE	300	Waukesha	06 20E 36	3	36	SE		T	C	E	GA	ASSC	II. INS	EU	
WHITNALL PARK POND	7300	Milwaukee	05 21E 05	15	10	DG	*	**			GA		II. B	EU	HM, NPS, URB/TURB, SED
UN LAKE, QUARRY LAKE	400	Racine	03 23E 06	20	64	SE					GA		II. INS		

*Winterkill – None of the lakes listed above have documented fish kills. However, any lake under 5 ft. in depth is likely to experience winterkill on a regular basis.
**Public Access – Private boats are not allowed on ponds in Milwaukee County Parks. Where available, commercial facilities provide boat liveries operated by the park.
Consumption Advisory – There is a statewide blanket fish consumption advisory for some fish in Wisconsin waters. To access the latest fish consumption advisory, go to http://www.dnr.state.wi.us/org/water/fhp/fish/advisories/

APPENDIX C. RARE PLANTS, ANIMALS AND COMMUNITIES IN THE ROOT-PIKE RIVER BASIN

Table 26. Rare Plants, Animals and Communities.

Common Name	Status	Type
SKIPJACK HERRING	END	FISH
RED-TAILED PRAIRIE LEAFHOPPER	END	INSECT
SILPHIUM BORER MOTH	END	MOTH
HARBINGER-OF-SPRING	END	PLANT
PURPLE MILKWEED	END	PLANT
BLUESTEM GOLDENROD	END	PLANT
COOPER'S MILKVETCH	END	PLANT
PINK MILKWORT	END	PLANT
SMOOTH PHLOX	END	PLANT
HEART-LEAVED PLANTAIN	END	PLANT
PALE FALSE FOXGLOVE	END	PLANT
RAVENFOOT SEDGE	END	PLANT
FALSE HOP SEDGE	END	PLANT
HAIRY FIMBRISTYLIS	END	PLANT
PRAIRIE WHITE-FRINGED ORCHID	END	PLANT
QUEEN SNAKE	END	SNAKE
LAKE--OXBOW	NA	COMMUNITY
FLOODPLAIN FOREST	NA	COMMUNITY
NORTHERN WET FOREST	NA	COMMUNITY
EMERGENT AQUATIC	NA	COMMUNITY
SOUTHERN SEDGE MEADOW	NA	COMMUNITY
CALCAREOUS FEN	NA	COMMUNITY
WET-MESIC PRAIRIE	NA	COMMUNITY
WET PRAIRIE	NA	COMMUNITY
SHRUB-CARR	NA	COMMUNITY
STREAM--SLOW, HARD, WARM	NA	COMMUNITY
SOUTHERN DRY-MESIC FOREST	NA	COMMUNITY
SOUTHERN MESIC FOREST	NA	COMMUNITY
GREAT LAKES BEACH	NA	COMMUNITY
LAKE DUNE	NA	COMMUNITY
DRY-MESIC PRAIRIE	NA	COMMUNITY
MESIC PRAIRIE	NA	COMMUNITY
OAK OPENING	NA	COMMUNITY
BLACK-CROWNED NIGHT-HERON	SC	BIRD
MULBERRY WING	SC	BUTTERFLY
BROAD-WINGED SKIPPER	SC	BUTTERFLY
DION SKIPPER	SC	BUTTERFLY
TWO-SPOTTED SKIPPER	SC	BUTTERFLY

Common Name	Status	Type
KARNER BLUE BUTTERFLY	SC	BUTTERFLY
PRAIRIE CRAYFISH	SC	CRUSTACEAN
LEMON-FACED EMERALD	SC	DRAGONFLY
LAKE STURGEON	SC	FISH
LAKE HERRING	SC	FISH
REDSIDE DACE	SC	FISH
LAKE CHUBSUCKER	SC	FISH
LEAST DARTER	SC	FISH
LIATRIS BORER MOTH	SC	MOTH
BIRD ROOKERY	SC	OTHER
MARSH BLAZING STAR	SC	PLANT
MARSH BLAZING STAR	SC	PLANT
OHIO GOLDENROD	SC	PLANT
GREAT INDIAN-PLANTAIN	SC	PLANT
TWINLEAF	SC	PLANT
AMERICAN GROMWELL	SC	PLANT
AMERICAN SEA-ROCKET	SC	PLANT
SMOOTH BLACK-HAW	SC	PLANT
SEASIDE SPURGE	SC	PLANT
CLIMBING FUMITORY	SC	PLANT
LESSER FRINGED GENTIAN	SC	PLANT
LOW CALAMINT	SC	PLANT
HEART-LEAVED SKULLCAP	SC	PLANT
DOWNY WILLOW-HERB	SC	PLANT
ONE-FLOWERED BROOMRAPE	SC	PLANT
WAXLEAF MEADOWRUE	SC	PLANT
WAFER-ASH	SC	PLANT
EARLEAF FOXGLOVE	SC	PLANT
PALE BEARDTONGUE	SC	PLANT
CRAWE SEDGE	SC	PLANT
RICHARDSON SEDGE	SC	PLANT
SWAN SEDGE	SC	PLANT
FLAT-STEMMED SPIKE-RUSH	SC	PLANT
WHIP NUTRUSH	SC	PLANT
LOW NUTRUSH	SC	PLANT
COMMON BOG ARROW-GRASS	SC	PLANT
INDIAN CUCUMBER-ROOT	SC	PLANT
REFLEXED TRILLIUM	SC	PLANT
SMALL YELLOW LADY'S-SLIPPER	SC	PLANT
SHOWY LADY'S-SLIPPER	SC	PLANT
LEAFY WHITE ORCHIS	SC	PLANT
SLIM-STEM SMALL-REEDGRASS	SC	PLANT

Common Name	Status	Type
TUFTED HAIRGRASS	SC	PLANT
WILCOX PANIC GRASS	SC	PLANT
CLUSTER FESCUE	SC	PLANT
CHRISTMAS FERN	SC	PLANT
VARIEGATED HORSETAIL	SC	PLANT
RED-SHOULDERED HAWK	THR	BIRD
REDFIN SHINER	THR	FISH
LONGEAR SUNFISH	THR	FISH
PRAIRIE MILKWEED	THR	PLANT
WOOLY MILKWEED	THR	PLANT
FORKED ASTER	THR	PLANT
HILL'S THISTLE	THR	PLANT
PALE-PURPLE CONEFLOWER	THR	PLANT
AMERICAN FEVER-FEW	THR	PLANT
PRAIRIE INDIAN PLANTAIN	THR	PLANT
YELLOW GENTIAN	THR	PLANT
SEASIDE CROWFOOT	THR	PLANT
ROUNDSTEM FOXGLOVE	THR	PLANT
HANDSOME SEDGE	THR	PLANT
STICKY FALSE-ASPHODEL	THR	PLANT
SMALL WHITE LADY'S-SLIPPER	THR	PLANT
SAND REED-GRASS	THR	PLANT
THICKSPIKE	THR	PLANT
BUTLER'S GARTER SNAKE	THR	SNAKE
BLANDING'S TURTLE	THR	TURTLE